United Technologies Corporation
9 Farm Springs Road
Farmington, CT 06032

United Technologies

Transmitted via Email

5 May 2016

Wayne Praskins
Remedial Project Manager
United States Environmental Protection Agency, Region IX
75 Hawthorne St. SFD-7-3
San Francisco, CA 94105

RE: Forensic Groundwater Investigation Report
Rockets, Fireworks, and Flares Superfund Site
San Bernardino County, California

Dear Mr. Praskins,

In accordance with the Administrative Settlement Agreement and Order on Consent between the U.S. EPA and Goodrich Corporation (Respondent) for Operable Units 2 and 3 of the Locust Avenue Superfund Site (now the Rockets, Fireworks and Flares Superfund Site), the Forensic Groundwater Investigation Report is enclosed.

Please contact me if you have any questions or comments in this regard.

Sincerely,
United Technologies Corporation

D. A. Bilder, Jr.
Remediation Project Manager

Enclosure: Forensic Groundwater Investigation Report

C: Amig, B. – UTC
Platt, D. – UTC
Teves, J. – EnSafe
Towell, D. – CH2M HILL
Yeich, B. - UTC

FORENSIC GROUNDWATER INVESTIGATION REPORT

ROCKETS, FIREWORKS, AND FLARES SUPERFUND SITE
SAN BERNARDINO COUNTY, CALIFORNIA

EnSafe Project Number:
0888816743

Prepared for:

United Technologies Corporation
United Technologies Building
Hartford, Connecticut 06101

Prepared by:

EnSafe Inc.
2151 Salvio Street, Suite 301
Concord, California 94520
(925) 305-2109
(800) 588-7962
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May 2, 2016

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PROFESSIONAL GEOLOGIST
JOSHUA A. TEVES
No.8670
STATE OF CALIFORNIA

May 2, 2016

Prepared by:

Josh Teves, PG
Project Manager

Reviewed by:

Jeffery James, PE
Principal

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List of Acronyms

‰	per mil
Δ or δ	Delta
µg/L	Micrograms per Liter
Cl	Chlorine
ClO_4^-	Perchlorate Ion
COC	Chain-of-Custody
DI-IRMS	Dual-Inlet Isotope Ratio Mass Spectrometry
Gal	Gallon
IX	Ion Exchange
IRMS	Isotope Ratio Mass Spectrometry
L/min	Liters per Minute
MCL	Maximum Contaminant Level
mg	Milligram
mL	Milliliter
OU	Operation Unit
PVC	Polyvinyl Chloride
SAP	Sampling and Analysis Plan

1.0 INTRODUCTION

EnSafe Inc. has prepared this Forensic Groundwater Investigation Report (Report) to detail the results of groundwater sampling and stable isotope analyses performed in the downgradient portion of Operable Unit (OU)-2 of the Rockets, Fireworks, and Flares Superfund Site (Site) in San Bernardino County, California, and to evaluate whether the origin of perchlorate detected in certain groundwater monitoring wells in this region is synthetic, indigenous, or associated with the past use of Chilean nitrate fertilizers in the region. Previous stable isotope analysis conducted in this portion of OU-2 suggests perchlorate in wells Colton-15 and 1S/5W-13B5S to be predominately non-synthetic in origin (Hatzinger, 2015). Efforts were made to sample two additional wells in this area (PW-14 and Colton-17) to better define the boundary of the OU-2 synthetic perchlorate plume. In addition, well 1S/5W-13B5S was sampled due to increases in perchlorate concentrations observed in 2014, to determine whether these increased concentrations could be attributable to perchlorate from another source. The locations of these wells are shown on Figure 1.

This Report summarizes the procedures used during sampling, sample processing, and sample analysis, as well as the results of the analysis.

2.0 SAMPLING PROCEDURES

Sample identification, management, analyses, and quality assurance were conducted in accordance with the Remedial Investigation/Feasibility Study Work Plan, Appendix A — Sampling and Analysis Plan (SAP) (EnSafe, 2013).

Sample collection was performed using ion-exchange (IX) columns, as described in Section 2.1.

The methods and procedures used for sample analysis were taken from the Guidance Manual for Forensic Analysis of Perchlorate in Groundwater using Chlorine and Oxygen Isotopic Analyses (Guidance Manual) (Hatzinger, 2011).

Legend

- Isotope Sampling Location
- Water Production Well

0 500 1,000 Feet

FIGURE 1
OU-2 STABLE ISOTOPE SAMPLING LOCATIONS
FORENSIC GROUNDWATER INVESTIGATION REPORT
ROCKETS, FIREWORKS, AND
FLARES SUPERFUND SITE
SAN BERNARDINO COUNTY, CA

REQUESTED BY: M. BAVISHI	ENSAFE
DRAWN BY: M. SENNE	1-800-588-7962 WWW.ENSAFE.COM
DATE: 2/12/2015	
PROJECT NO: 0888816743	

X:\UTC\Rialto_CA\OU2_Isotope_Sample_Locs.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2.1 General Sampling Procedures

This section describes the procedures used in completing the field sampling, as well as the processes used to preserve the quality of the samples. The methods by which samples were handled, prepared, and shipped are also described.

Before sampling, each well was purged at a continuous flow rate and continuously monitored for field parameters, which included temperature, pH, turbidity, conductivity, and dissolved oxygen. Once the field parameters were stable, the well was deemed ready to sample.

The total volume needed at each well for isotopic analysis was derived from the lowest concentrations detected in the past two monitoring events at each well, with the exception of Colton-17. For Colton-17, which has contained concentrations ranging from not-detect to 12 micrograms per liter (µg/L) within the last several years, a concentration of 5.3 µg/L from March 2014 was used. This concentration was considered conservative as the measured concentrations during frequent sampling beginning in July 2014 were consistently at or above 9 µg/L. For the three proposed sample locations, the calculations of required sample water are summarized below:

PW-14:	10 mg ÷ 0.0394 mg/L = 253.81 L ÷ 3.8 L/Gal = 66.79 Gal
Colton-17:	10 mg ÷ 0.0053 mg/L = 1886.79 L ÷ 3.8 L/Gal = 496.52 Gal
1S/5W-13B5S:	10 mg ÷ 0.0383 mg/L = 261.10 L ÷ 3.8 L/Gal = 68.71 Gal

The above values were increased by 10% during sampling to allow for a margin of safety.

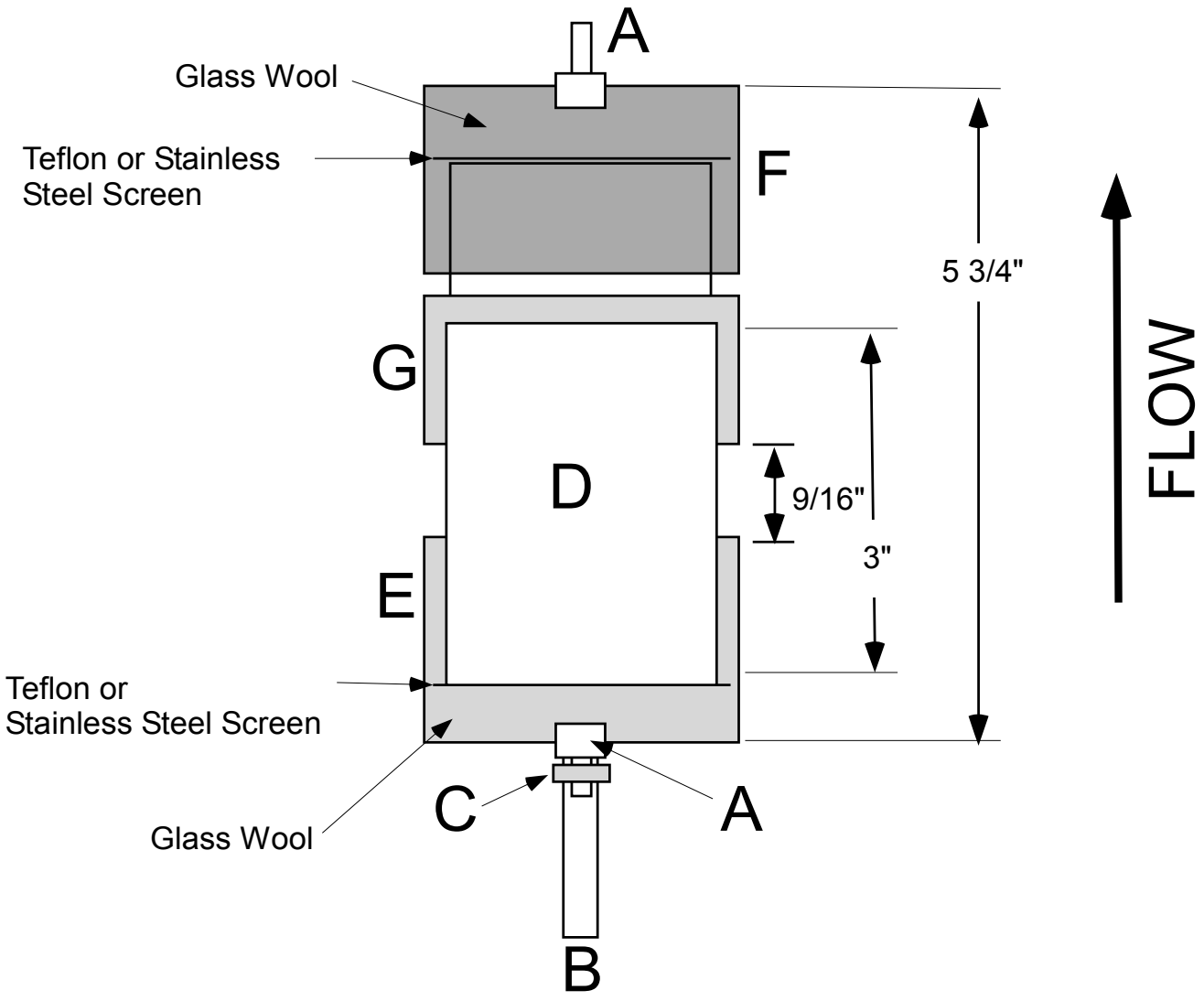
It was not possible to collect the necessary volume of water at well PW-14 due to its construction as a Westbay well. Appropriate Westbay tools were first used to open the desired screen interval at 425 feet below ground surface, and a Waterra actuator equipped with dedicated Teflon tubing and a check valve was used to attempt sampling at well PW-14. However, the depth of the well, coupled with the presence of Westbay components within the well, caused sampling to be unsuccessful at PW-14.

After purging, but prior to isotopic sampling, samples for perchlorate were collected from Colton-17 and 1S/5W-13B5S by filling laboratory-supplied containers in accordance with the SAP. During sampling for isotopic analysis, water was pumped either directly from the well or from a side stream to the inlet port of an IX column using plastic tubing and metal and/or plastic fittings and connections. The IX column was constructed of 1.25-inch-diameter, Schedule 80 polyvinyl chloride (PVC), which contained approximately 100 milliliters (mL) (~60 grams dry weight) of Purolite A-530E ion-exchange resin

(IX resin). As water passed through the columns, perchlorate (ClO_4^-) ions were captured by the IX resin. Flowrates were kept under 2 liters per minute (L/min) to allow adequate residence time for perchlorate adsorption in the IX resin within the column. A schematic of the IX columns used for sampling is shown in Figure 2. Once an adequate volume of water passed through the IX column to obtain a minimum of 10 milligrams of perchlorate, sampling ceased.

As mentioned above, samples were collected at the beginning of sampling activities from 1S/5W-13B5S and Colton-17 and analyzed for perchlorate via U.S. Environmental Protection Agency Method 314.0. The perchlorate sample collected from 1S/5W-13B5S, after purging but prior to sampling with the IX column, indicated the groundwater in this well contained perchlorate at a concentration of 4.2 µg/L instead of the 38.3 µg/L used in the calculation described above. As a result, although an adequate amount of water was collected based on the above calculations, the stable isotopic sample collected in the IX column for this well did not contain enough perchlorate to complete the forensic analyses.

The IX columns were processed and shipped to the Environmental Isotope Geochemistry Laboratory at the University of Delaware as described in Section 2.2. The perchlorate sample bottles were processed and shipped to Accutest Northern California for analysis as described in Section 2.2. It should be noted that Colton-17 was initially sampled on April 3, 2015, but an accident at the Environmental Isotope Geochemistry Laboratory required that the well be re-sampled on August 10, 2015.



A = 1/4" x 1/8" polypropylene or brass hose fitting (2)
B = Tygon tubing (2 ft) 1/4"x3/8"
C = Hose clamp (1)
D = 1 1/4" clear PVC pipe, sch 80 (2 3/4")
E = 1 1/4" PVC sch 40 end cap (1) F = 1 1/4" PVC sch 80 threaded cap (1)
G = 1 1/4" PVC sch 40 male adaptor NPT x socket weld (1)

FIGURE 2
SCHEMATIC DIAGRAM OF ION EXCHANGE (IX)
COLUMN USED TO COLLECT ClO_4^- FROM GROUNDWATER

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SAN BERNARDINO COUNTY, CA

REQUESTED BY: M. BAVISHI	ENSAFE
DRAWN BY: M. SENNE	
DATE: 2/10/2015	1-800-588-7962 WWW.ENSAFE.COM
PROJECT NO: 0888816743	

X:\UTC\Rialto_CA\Figure2-2.mxd

2.2 Sample Handling and Processing

The following procedures were performed immediately after collection in order to preserve the samples, maintain their integrity, and document important information:

- Sample identification, collection date and time, and chemical preservative was clearly written on the sample label.

- Samples were placed on wet ice contained in double-bagged re-sealable bags immediately after collection and during shipment to the laboratory as to maintain temperature at less than 4 degrees Celsius. With the exception of during sample collection, IX columns were maintained at approximately 4 degrees Celsius once received and through delivery to the laboratory.

- Samples were packed so as to avoid breakage during transport and prevent cross-contamination. A clean sample cooler in good condition was used.

- A chain-of-custody (COC) record describing the contents of each cooler was maintained while sampling and provided to the laboratory with the samples. The COC record was filled out in the field and each sample was entered on the COC as it was collected. Relevant COC documentation is included with laboratory reports in Appendix A.

- At the time of collection, all samples were identified and fully documented in the field logbook, on the COC forms, and on the sample labels.

2.3 Sample Analyses

The perchlorate samples collected from each well were analyzed at Accutest Northern California via U.S. Environmental Protection Agency Method 314.0. Oxygen isotopes were analyzed via Dual-Inlet Isotope Ratio Mass Spectrometry (DI-IRMS) as described in Section 2.4.2 of the Guidance Manual. ^{37}Cl was analyzed via DI-IRMS as described in Section 2.5.2 of the Guidance Manual. All isotope analyses were performed at the Environmental Isotope Geochemistry Laboratory at the University of Delaware. The determination of the percent contribution of the three possible perchlorate sources, which include indigenous, non-synthetic, the Chilean nitrate fertilizers, was performed by EnSafe using the IsoError stable isotope mixing model developed by Phillips and Gregg (2001).

2.4 Decontamination

Clean nitrile gloves were used at each sampling well to prevent sample contamination. Equipment decontamination was not required since each of the three wells used dedicated sampling equipment.

3.0 ANALYTICAL RESULTS

3.1 General Chemistry

The analytical results for the perchlorate concentrations in Colton-17 and 1S/5W-13B5S are summarized below:

Sample	Date	Perchlorate Concentration (micrograms per liter)
1S/5W-13B5S	April 8, 2015	4.2
Colton-17	April 3, 2015	7.2
Colton-17	August 10, 2015	1.9

The results of perchlorate analysis indicate that the perchlorate concentration measured at well 1S/5W-13B5S was less than the California Maximum Contaminant Level (MCL) of 6 µg/L and much less than the previously measured concentrations of 38.3 µg/L and 45.1 µg/L in August 2014 and November 2014, respectively. During the August 2015 annual site-wide groundwater sampling event, perchlorate was detected at 1.2 µg/L in 1S/5W-13B5S, which is also below the California MCL. It is unclear why concentrations of perchlorate in this well were elevated in 2014 as concentrations prior to 2014 and in sampling events since then have remained below the MCL.

3.2 Isotopic Analyses

The samples listed above were submitted for isotopic analysis of $\Delta^{17}O$‰, $\delta^{18}O$‰, and $\delta^{37}Cl$‰. Only the sample collected from Colton-17 on August 10, 2015, was successfully analyzed. All results are normalized against the Standard Mean Ocean Chloride standard for chloride isotopes or the Standard Mean Ocean Water standard for oxygen isotopes. Normalization allows for meaningful inter-laboratory data comparisons where large variations in the isotopic signature of local waters may skew direct comparisons of raw data. Results are summarized below:

Sample	$\delta^{37}Cl$‰ SMOC	$\delta^{18}O$‰ SMOW	$\Delta^{17}O$‰ SMOW
Colton-17	-4.8	-13.9	4.2

Notes:
SMOC Standard Mean Ocean Chloride, NIST-975a reference standard
SMOW Standard Mean Ocean Water, USGS-37 and USGS-38 $KClO_4$ reference standards

Full analytical outputs are included in Appendix A.

4.0 DISCUSSION AND CONCLUSIONS

Using the IsoError stable isotope mixing model developed by Phillips and Gregg (2001), ratios of dual isotopes in the Colton-17 sample were compared against three potential end-member perchlorate sources represented by synthetic, indigenous, and Atacama (Chilean) perchlorate as reported by Hatzinger et. al., (2015), Table 3.2. Because the synthetic and indigenous reference populations have significant overlap in the possible ranges of δ^{37}Cl‰ and Δ^{17}O‰, any comparisons drawn between these two isotopes alone are highly variable and potentially inconclusive. Therefore, it is common to omit this particular comparison due to the ambiguity of the results. Because the δ^{18}O‰ reference populations are better resolved, population contributions calculated from δ^{18}O‰ and either δ^{37}Cl‰ or Δ^{17}O‰ are used to calculate contributions from known sources. Based on Δ^{17}O‰ vs δ^{18}O‰ and δ^{37}Cl‰ vs δ^{18}O‰, the source of perchlorate present at Colton-17 is approximately 60% synthetic and 40% Chilean with negligible contribution from naturally-deposited indigenous perchlorate. Previous stable isotope analyses conducted in this portion of OU-2 indicated that perchlorate in wells Colton-15 and 1S/5W-13B5S was predominately Chilean in origin.

Based on the results of the recent stable isotope analyses performed on the sample collected from Colton-17, and previous stable isotope analyses conducted on Colton-15 and 1S/5W-13B5S, it appears that the downgradient extent of the OU-2 synthetic perchlorate plume is delineated by these wells. No further delineation of the OU-2 synthetic perchlorate plume appears necessary at this time.

5.0 REFERENCES

EnSafe Inc. *Remedial Investigation/Feasibility Study Work Plan, Locust Avenue Superfund Site, Operable Units 2 and 3, Rialto, San Bernardino County, California, Appendix A — Sampling and Analysis Plan, Locust Avenue Superfund Site, Operable Units 2 and 3, Rialto, San Bernardino County, California*. 2013.

Hatzinger, P., et. al. *Evaluation of Perchlorate Sources in the Rialto-Colton-Fontana Area Using Chlorine and Oxygen Stable Isotope Ratio Analysis and Depth-Dependent Water Quality Data.* March 2015.

Hatzinger, P.B., Böhlke J.K., Sturchio N.C., Gu, B. *Guidance Manual for Forensic Analysis of Perchlorate in Groundwater using Chlorine and Oxygen Isotopic Analyses*. 2011.

Phillips, D.L. and Gregg, J.W. *Uncertainty in Source Partitioning Using Stable Isotopes.* Oecologia. Springer-Verlag, New York, NY, 127:171-179. 2001.

Appendix A
Laboratory Analytical Reports

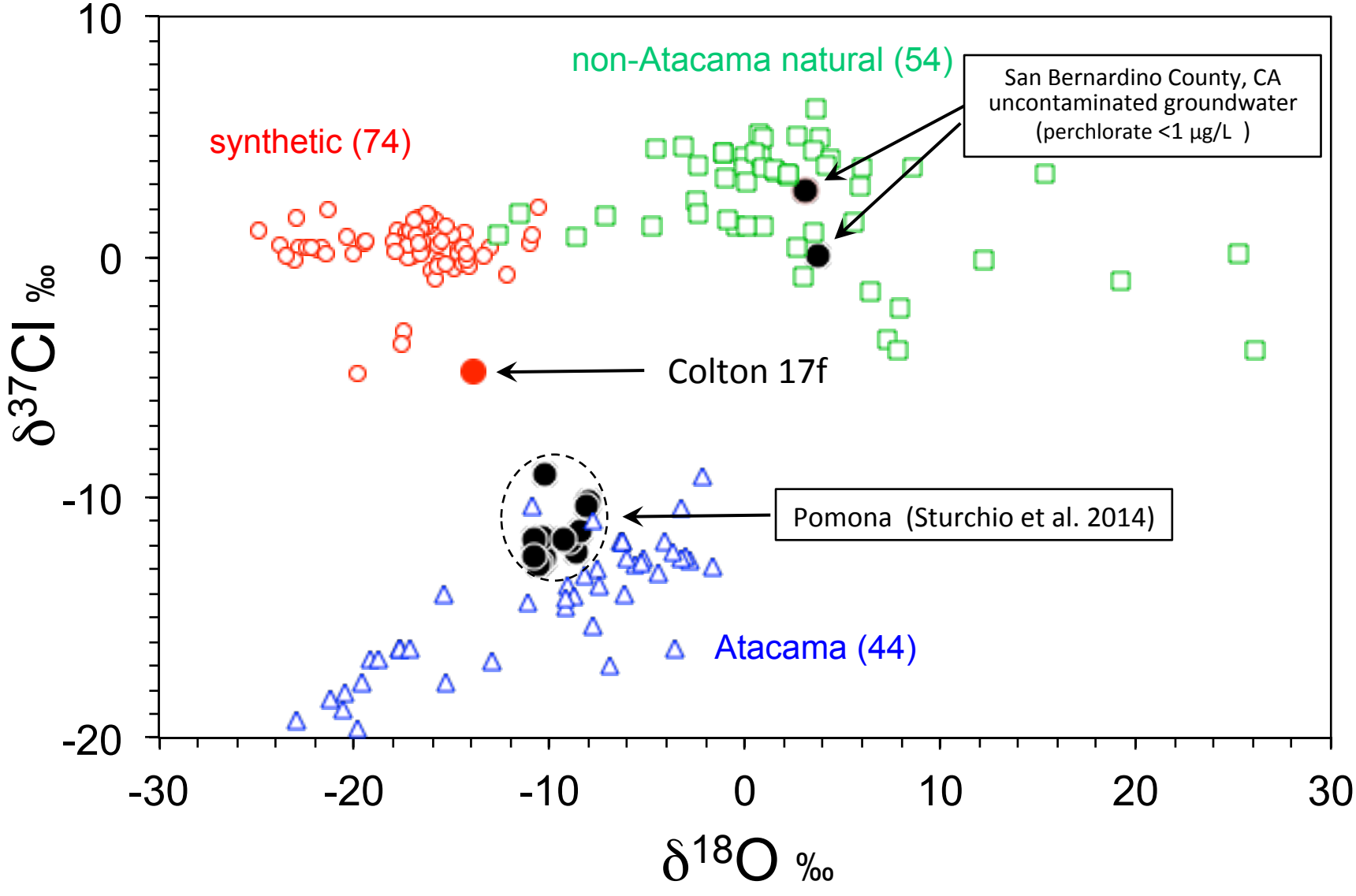
Environmental Isotope Geochemistry Laboratory - Final Data Report

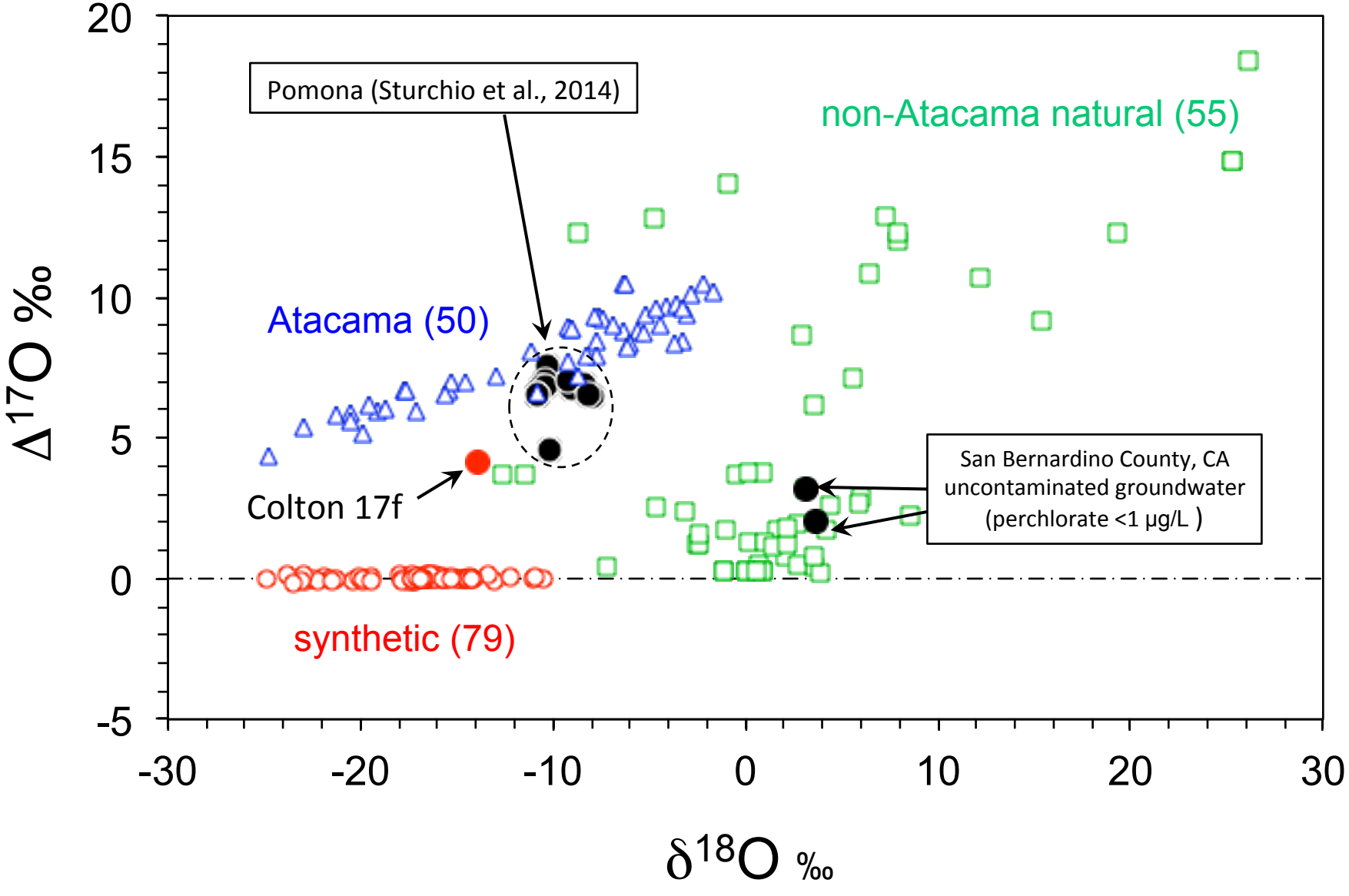
Client: Josh Teves, EnSafe
Date: March 24, 2016
Sample Type: perchlorate on A530E resin column
Analysts: Neil C. Sturchio (extractions/purifications) and Linnea Heraty (mass spectrometry)

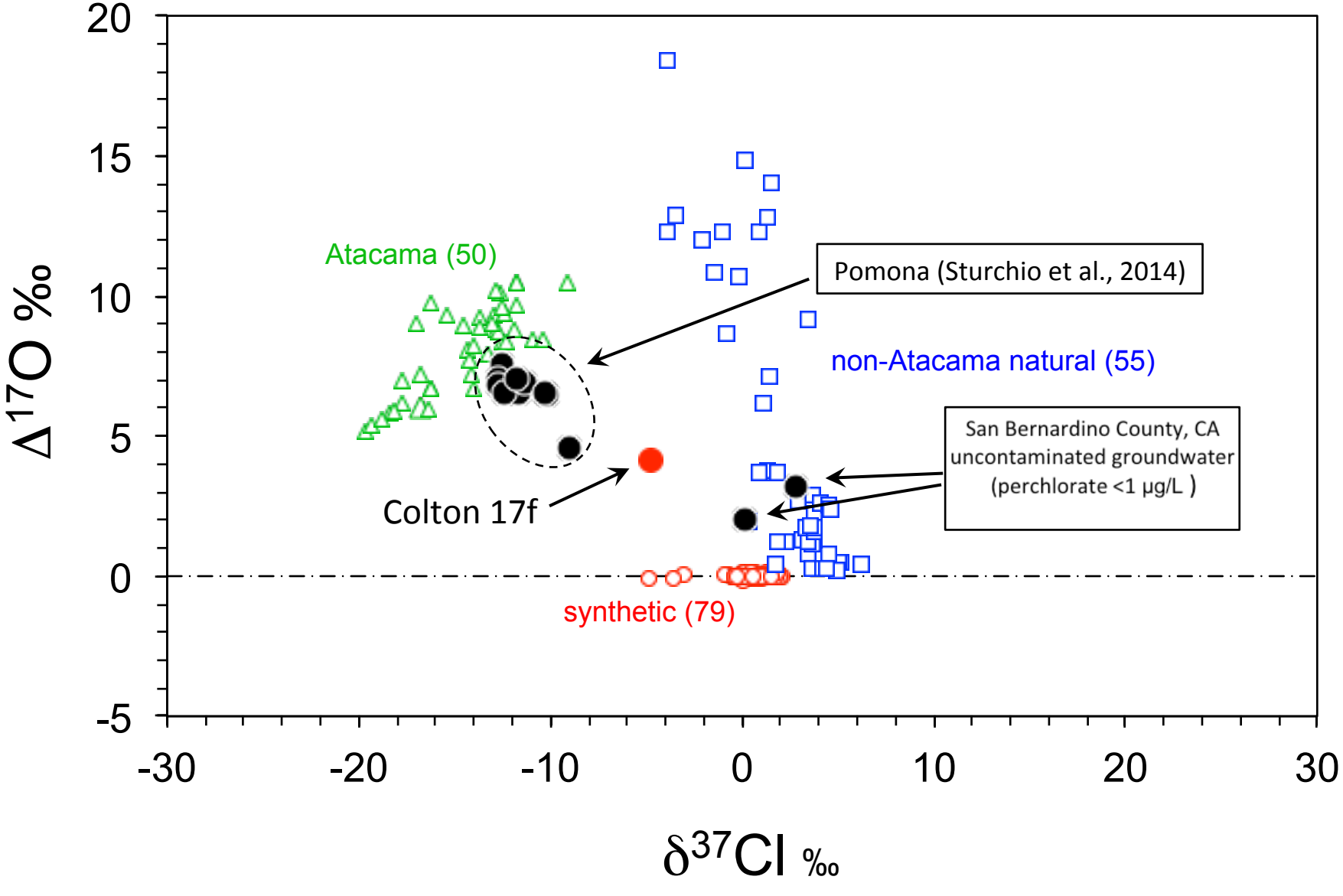
EIGL ID	Client ID	$\delta^{37}Cl$, ‰ SMOC	$\delta^{18}O$, ‰ SMOW	$\Delta^{17}O$, ‰ SMOW
J-1703	column 449 sample Colton 17f; ClO_4 yield =0.61 mg	-4.8	-13.9	4.2

Cl isotope ratio results normalized to NIST-975a reference material
O isotope ratio results normalized to USGS-37 and USGS-38 $KClO_4$ reference materials

Estimated 1-σ uncertainties: $\delta^{37}Cl$, ±0.3 ‰; $\delta^{18}O$, ±0.5 ‰; $\Delta^{17}O$, ±0.2 ‰
Analytical procedures described in Hatzinger et al., 2011*


non-Atacama natural (54)
synthetic (74)
San Bernardino County, CA
uncontaminated groundwater
(perchlorate <1 µg/L)
Colton 17f
Pomona (Sturchio et al. 2014)
Atacama (44)
10
0
-10
-20
-30
-20
-10
0
10
20
30
δ37Cl ‰
δ18O ‰


Pomona (Sturchio et al., 2014)
non-Atacama natural (55)
Atacama (50)
Colton 17f
San Bernardino County, CA
uncontaminated groundwater
(perchlorate <1 µg/L)
synthetic (79)
20
15
10
5
0
-5
-30
-20
-10
0
10
20
30
Δ17O ‰
δ18O ‰


Atacama (50)
Pomona (Sturchio et al., 2014)
non-Atacama natural (55)
San Bernardino County, CA
uncontaminated groundwater
(perchlorate <1 µg/L)
Colton 17f
synthetic (79)
Δ17O ‰
δ37Cl ‰
20
15
10
5
0
-5
-30
-20
-10
0
10
20
30

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221 Academy St, ISE lab 458, Newark DE 19716
lab (302)831-8022, fax (302)831-4158
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CHAIN OF CUSTODY

Project: UTC-RFF Superfund
Location: Rialto, Ca

Primary Contact: Josh Teves
Company: Ensafe
Address: 2151 Salvio St #301 Concord, Ca
Phone: 925 305 2109
email: steves@ensafe.com

Report to: Josh Teves
Company:
Address:
Phone:
email:

Prepared/ Sampled by: Manlik Barishi mbarishi@ensafe.com

Date: 8/11/15 page 1 of 1

	Sample ID:	Other ID info:	Description:	Purpose/Comments:	EIGL ID:
1	Colton 17 F	Column 449	Municipal well	Re-sample	
2					
3					
4					
5					
6		J-1703			
7					
8					
9					
10		replacement sample use same J# as 1st Colton 17 F			
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21				rcd. cool	
22					
23					
24					
25					
26					
27					
28					
29					
30					

Relinquished By: M Barishi	Date: 8/11/15 Time 14:55	Received By: Henry Caballero - FedEx 0719	Date: 8/11/15 Time 2:45 pm
Relinquished By:	Date: Time	Received By:	Date: 8.13.15 Time 14:00

ironmental Isotope Geochemistry Laboratory
ological Sciences Department
University of Delaware

221 Academy St, ISE lab 458, Newark DE 19716
lab (302)831-8022, fax (302)831-4158
lheraty@udel.edu, sturchio@udel.edu

CHAIN OF CUSTODY

Project:

Location:

Send to Primary Contact: Josh Teves
Company: Ensafe
Address: 2151 Salvio Street Concord Ca 94520
Phone: 925 305 2109
email: jteves@ensafe.com

Report to:
Company: Ensafe
Address: 2151 Salvio street Concord, Ca
Phone: 925 305 2109
email: jteves@ensafe.com

Prepared/ Sampled by: M. Bavishi mbavishi@ensafe.com

Date: 4/8/15 page 1 of 1

	Sample ID:	Other ID info:	Description:	Purpose/Comments:	EIGL ID:
1	colton17F	column 448	municipal well		
2	SWB5F280	column 447	monitor well		
3					
4					
5					
6					
7					
8					
9					
10					
11				not used for sampling per phone call w/ M. Bavishi	
12		rcc	#449		
13					
14			#447		
15					
16					
17					
18			#???	sharpie	
19				label removed	
20				possibly 448?	
21					
22				(#8 clarity visible)	
23					
24					
25					
26					
27					
28					
29					
30					

Relinquished By:	Date: 4/8/15 Time 1645	Received By:	Date: 4.10.15 Time 1400
Relinquished By:	Date: Time	Received By:	Date: Time

Environmental Isotope Geochemistry Laboratory
University of Illinois at Chicago

Extraction and Purification of Perchlorate for Isotopic Analysis
as of May 2011

CONFIDENTIAL: This worksheet is the property of Environmental Isotope Geochemistry Laboratory (EIGL) of the University of Illinois at Chicago. Please do not distribute outside EIGL operations.

I. Sample Identification and Information

Client: Ensafe

Date Received: _____

Isotopes of Interest: ☐ Cl-37 ☐ Cl-36 ☐ O-18

Client Sample ID: Colton 17f-re (replacement)

EIGL Lab ID: J-1703b G-2937

Column No.: 449

Estimated Perchlorate on column (mg): _____

Final Perchlorate recovered (mg): _____

Sample Description and Comments:

- slight grey-tan color; all OK

EIGL ID: J-1703b Sample ID: Colton 17F Client: Ensafe

II. Sonication:

a. Transfer resin into 250-mL beaker using 1.5 BV UP Di H_2O and sonicate for 3 minutes. Collect sonic washes in properly labeled 500-mL bottles.

b. Repeat step a. until sonic washes are clear.

By: NCS Date: 9/8/15

Comments: - 1st wash nearly clear
- 2nd wash ~ clear

III. Pre-Flush:

✓ a. Transfer resin into 150-mL column using Di H_2O as necessary. Drain liquid up to the top of the resin and save the liquid together with the sonic washes.

✓ b. Flush the resin with 4BV of 4M HCl at 5 mL/min. Collect the pre-flushes in appropriate, properly labeled bottles.

✓ c. If resin is not immediately eluted, follow the acid with 1BV UP Di H_2O. Do not drain completely, leaving ~2 cm high H_2O above the resin. Collect the liquid with the pre-flushes.

By: NCS Date: 9/12/15

Comments:

IV. Elution:

✓ a. Elute the resin with 3BV of $FeCl_3$/HCl eluent at 2 mL/min. Collect the eluent in 1-L flasks.

✓ b. Pass through 3BV of UP Di H_2O. Collect the liquid in the same flasks used for the eluent.

✓ c. Dilute the eluent some more with 6BV of UP Di H_2O. Total dilution is 3x that of the eluent.

By: NCS Date: 9/12/15 Total volume: 1200 mL

Comments:

V. Fe-removal:

✓ a. Use column filled with cation resin having a volume 2x that of the eluent. Pass sample through the column and collect in beakers. Volume cation resin: 600 mL

✓ 2BV b. Pass ~~3BV~~ UP Di H_2O to rinse the cation resin and save in the same beaker with the Fe-removed solution.

✓ By: NCS Date: 9/14/15 Total Volume: 2400 mL

Comments:

· first, flush cation column w/ DIW (2 BV)

EIGL ID: J-1703-b Sample ID: Colton 17f ic Client: Ensafe

VI. Concentration:

a. Add 1 mL concentrated H_2O_2.

b. Cover the beaker with cover glass and put it on the hot plate for evaporation.

c. If samples are in multiple beakers, combine them in one beaker as soon as the solution is about 200 mL.

d. Add another 1 mL concentrated H_2O_2.

e. Once < 200 mL, transfer in 250-mL beaker. Continue evaporating until the volume is about 25 mL.

f. Remove from the hot plate and let it cool down. Take an aliquot for IC analysis.

Dilution Factor: _____ ClO_4 (ppm): _____

ClO_4 (mg): _____

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 9/17/15

Comments: _____

VII. Reload:

a. Transfer sample into a 60-mL bottle. Rinse the walls of the beaker and collect them together with the sample solution.

b. Dilute the sample solution with UP Di H_2O to ~40 mL.

c. Add 2 mL of clean Purolite resin into the bottle containing the sample solution.

d. Put on the shaker at low setting for at least an hour. 1235 PM → 245 PM

e. Pipet out the sample solution, leaving the loaded Purolite resin in the bottle.

f. With the use of small volumes of UP Di H_2O, transfer the loaded Purolite resin into a small column with 2-mL of clean Purolite resin. Make sure to collect the UP Di H_2O together with the sample solution. Avoid air bubbles forming inside the column.

g. Pass the sample solution through the small column, now with 4-mL Purolite resin at 1 mL/min.

By: NCS Date: 9/18/15

Comments: _____

VIII. Second flush

a. Pass 4 BV of 4 M HCl through the small column at 2 mL/min.

b. Collect HCl flushes in the same bottle that contains the reloaded sample solution.

By: NCS Date: 9/21/15

Comments: _____

EIGL ID: J.1703 b Sample ID: Colton 17f re Client: Ensafe

IX. Elution of reload:

a. Using small volume of UP Di H_2O, transfer the loaded Purolite resin into a 60-mL bottle.

b. Add 3BV of $FeCl_3$/HCl eluent and put on the shaker at low setting for 2 hours.

c. Pipet out the eluent into a 125-mL flask and leave the eluted Purolite resin in the bottle. Use a funnel with a filter paper to avoid any resin from mixing with the eluent in the flask. 11:20 → 15:40 NEXT DAY

d. Add a total of 3 BV (1 BV at a time) of UP Di H_2O into the bottle and shake. This will completely rinse the Purolite resin of the eluent.

e. Pipet out the rinse and add it together with the eluent in the 125-mL flask.

By: NCS Date: 9/21/15 Total volume: 36 mL

Comments:

X. Fe-removal:

a. Prepare small columns with cation resins twice the volume of eluent. Pass through the diluted eluent. Collect in appropriate beakers. Volume cation resin: 30 mL

b. Follow with 3BV UP Di H_2O. 111

By: NCS Date: 9/22/15 Total volume:

Comments:

Some Fe breakthrough - repeated after flushing Fe from cation column using 4M HCl & DIW.

XI. Concentration:

a. Cover the beaker and put on hot plate. Add 2 drops of H_2O_2. Evaporate to 10 mL.

b. Transfer solution to a Teflon beaker. Rinse the walls of the glass beaker and collect together with the sample solution.

c. Evaporate further to <0.5 mL at low heat.

By: NCS Date: 9.23.15

Comments:

XII. Cl-removal

a. Prepare two Ag OnGuard cartridges attached together by flushing with 150 mL UP Di H_2O.

b. Prepare small columns with 3 mL cation resin flushed with 150 mL UP Di H_2O.

c. Once the sample solution is <0.5 mL, remove from hot plate and let it cool down. Dilute it to 3 mL with UP Di H_2O.

d. Using a syringe, pass the diluted solution through the attached Ag OnGuard cartridges into the small cation resin columns. Collect in 15-mL centrifuge tubes.

e. Flush the Ag onguards 2x with 2 mL UP Di H_2O into the cation resin columns. Collect in the same centrifuge tubes with the sample.

f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. Total Volume: 14.0 mL

EIGL ID: J-1703b Sample ID: Colton 17f-Te Client: EnSafe

g. Watch for possible precipitation. If solution is a little cloudy, let it sit overnight. Then proceed to XII.

~~h. If the sample solution is clear, take an aliquot for IC analysis.~~

~~Dilution Factor: _____ ClO_4 (ppm): _____~~

~~ClO_4 (mg): _____~~

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 9.30.15

Comments: _____

XIII. Final ion clean up before SPE

√ a. If precipitation has occurred, centrifuge the samples to separate the precipitates from the solution.

√ b. Prepare Ba-Ag-H OnGuard cartridges attached together in sequence by flushing through ~~150~~ 50 mL UP Di H_2O.

√ c. Prepare 3 mL cation resin column by flushing through ~~150~~ 20 mL UP Di H_2O.

√ d. Using a syringe, pass the centrifuged solution through the Ba-Ag-H OnGuard cartridges into the cation resin column. Collect in 50-mL centrifuge tubes.

√ e. Flush the Ba-Ag-H OnGuard cartridges 2x with 3 mL UP Di H2O into the cation resin columns. Collect in the same centrifuge tubes with the sample.

√ f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. Total Volume: 10 mL

√ g. Take 3 mL aliquot for IC analysis.

Are other anions still present? ☐ YES ☐ NO

How much ClO_4 in the sample? _____ ppm or 1.25 mg 1 mL taken for IC

√ h. Return aliquot to the centrifuge tube. If possible, evaporate down the samples to 10 mL in the oven.

By: NCS Date: 10.20.15 (fin 9 mL) diluted to 5 mL

Comments: _____

EIGL ID: J-1703-D Sample ID: Colton 17F Client: EnSafe

I. $TPAClO_4$ Precipitation:

a. Evaporate the sample to 0.5 mL and transfer into a clean 4-dram clear glass vial labeled as "SAMPLE ID TPA" by using a pipette.

b. Add 1mL of 0.1M Tetrapentylammonium Bromide (TPABr) per 1 mg of perchlorate into the glass vial containing the sample.

c. Cap the glass vial and place in the refrigerator for an hour to finish $TPAClO_4$ precipitation.

By: NCS Date: 11/13/15

Comments:

II. $TPAClO_4$ First UP DIW Rinse:

a. Label a new pre-cut 5 mL centrifuge-filter tube. Insert the uncapped glass vial into the mouth of the centrifuge-filter tube. Centrifuge at 2000 rpm for 3.5 minutes. Make sure that all the liquid has passed through the filter. Collect the supernatant in a separate 15-mL centrifuge tube labeled as "SAMPLE ID $TPAClO_4$ WASH."

b. Rinse the glass vial and centrifuge-filter tube with 1 mL of ice-cold UP DIW (~0°C). Gently shake the glass vial and then centrifuge similarly as in step II-a. Add the washes into the same 15-mL centrifuge wash tube in step II-a. Repeat 3X.

c. Extensively rinse the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

d. Add acetone into the glass vial to dissolve the $TPAClO_4$. Then pipette the acetone carefully from the vial into the centrifuge-filter tube. Centrifuge as in step II-a. Transfer all acetone with dissolved $TPAClO_4$ into a new 4-dram clear glass vial labeled as "SAMPLE ID 0.5 mL." Mark the 0.5 mL level on the glass vial with a Sharpie. Repeat 3X.

e. Put the glass vial with the dissolved $TPAClO_4$ inside the oven at 50°C overnight to evaporate the sample to dryness.

By: NCS Date: 11-25-15

Comments:

III. $TPAClO_4$ Second UP DIW Rinse:

a. Remove samples from the oven and let them cool down.

b. Add 200 μL acetone in the glass vial to dissolve all $TPAClO_4$ then add 1 mL UP DIW to re-precipitate $TPAClO_4$.

c. Put the samples inside the oven at 90°C to evaporate down to about 0.5 mL.

d. Remove the samples from the oven and cap them immediately. Place them in the refrigerator for at least 30 minutes.

e. Weigh new 4-dram clear glass vials (without cap) labeled as "SAMPLE ID $KClO_4$." Record the tare.

f. Remove the samples from the refrigerator and centrifuge similarly as in step II-a. Collect all supernatant in the same 15-mL centrifuge tube in step II-a.

g. Rinse $TPAClO_4$ precipitates similarly as in step II-b.

EIGL ID: J 1703b Sample ID: Colton 17f re Client: En Safe

h. Clean the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

i. Dissolve all $TPAClO_4$ similarly as in step II-d. Use the new 4-dram clear glass vials tarred in step III-e to collect all the acetone with dissolved $TPAClO_4$.

j. Place the samples inside the oven at 50°C overnight to evaporate to dryness.

By: NCS Date: 12/2/15

Comments:

IV. $TPAClO_4$ to $KClO_4$:

✓ a. Remove the samples from the oven and cap immediately. Let them cool down to room temperature.

b. Weigh samples uncapped and subtract the tare weights to obtain the weight of $TPAClO_4$.

✓ c. Add 200 µL of freshly made 0.5 M KOH in absolute ethanol per 1 mg of ClO_4 into each glass vial to precipitate $KClO_4$. Let it mature for an hour while mixing the precipitates a few times. Make sure that there are no big crystals stuck on the glass vial walls. Use a new yellow pipette tip to crush the crystals.

d. Put the capped glass vial upright in a 50-mL centrifuge tube wrapped with paper towel to protect the glass vial. Centrifuge at a maximum of 3500 rpm for 5 minutes.

✓ e. Transfer the supernatant into a new and properly labeled pre-cut centrifuge-filter tube using a precision pipette (blue tip). Insert the glass vial into the centrifuge-filter tube and centrifuge similarly as in step II.a. Make sure that all the liquid has passed through the filter. Leave the supernatant in the liquid receiver of the centrifuge-filter tube.

✓ f. Rinse the glass vial walls carefully with 200 µL absolute ethanol. Pipette the ethanol rinse from the glass vial into the centrifuge-filter tube. Insert the glass vial into the centrifuge-filter tube and centrifuge at 2000 rpm for 3.5 minutes. Leave the ethanol rinse in the liquid receiver of the centrifuge-filter tube. Repeat 4X. Transfer all the rinses in the liquid receiver to a new 4-dram clear glass vial labeled as "SAMPLE ID ETHANOL WASH."

✓ g. Extensively rinse the liquid receiver of the centrifuge-filter tube with UP DIW to remove all traces of ethanol-KOH solution.

✓ h. Leave open the centrifuge-filter tube, liquid receiver, and glass vial at room temperature covered from dust for at least 5 hours. This will evaporate any residual ethanol.

✓ i. Dissolve all $KClO_4$ by rinsing the glass vial and centrifuge-filter tube with 1 mL of UP DIW and centrifuge as in step IV.f. Repeat 3X. Transfer all dissolved $KClO_4$ into a clean IC vial labeled "SAMPLE ID $KClO_4$."

✓ j. Run the sample on the IC to check the purity and amount of recovered ClO_4.

By: NCS Date: 12/6/15

Comments:

- dilute to 10 mL DIW

- take 1 mL → 5 mL for IC

1.02 mg ClO_4 in 9 mL

9

EIGL ID: 1703b Sample ID: Colton 17f Client: EnSafe

V. $KClO_4$ Second Ethanol Rinse:

a. Transfer the sample into new 15-mL centrifuge tube, properly labeled as "SAMPLE ID $KClO_4$ 2nd ETHANOL RINSE." Place centrifuge tubes uncapped in the oven at 80°C overnight to evaporate to dryness.

b. Once all $KClO_4$ has dried, take the sample out from the oven. Cap it and let it cool down to room temperature.

c. Add 200 µL absolute ethanol and crush the $KClO_4$ precipitates using the tip of the precision pipette. Let it sit for 10 minutes.

d. Shake the centrifuge tube by using the Vortex Mixer.

e. Centrifuge at 3000 RPM for 3.5 minutes. Pipette out the supernatant and save it in the same 4-dram clear glass vial in IV.f (SAMPLE ID ETHANOL WASH). Repeat V.c., d., and e. 3X.

f. Leave the centrifuge tube uncapped and protected from dust to evaporate out any remaining ethanol for at least an hour. If liquid ethanol is not visible anymore, place the centrifuge tubes in the oven at 50°C for 15 minutes to completely evaporate ethanol.

g. Take the samples out from the oven and dissolve all $KClO_4$ with 1 mL UP DIW. Pipette the dissolved $KClO_4$ out and transfer into a new 15-mL centrifuge tube labeled as "SAMPLE ID $KClO_4$ RECRYSTALLIZED."

h. Put the samples uncapped inside the oven at 80°C to evaporate to dryness overnight.

i. Tare IC vials and record this number.

j. Take the samples out from the oven. Dissolve $KClO_4$ crystals with 3 mL warm UP DIW and transfer into clean, labeled (SAMPLE ID KClO4 final), and tarred IC vial. Weigh the IC vial with the sample. Sample weight = (vial + sample weight) – tare vial weight. Run on the IC.

k. Once IC results are satisfactory, transfer into a labeled combustion tube. Place in an oven-pump to evaporate to dryness.

By: NCS Date: 12-11-15 - looks fairly clean, slight tinge

Comments:

~1 mg passed through SPE

Environmental Isotope Geochemistry Laboratory
University of Illinois at Chicago

Extraction and Purification of Perchlorate for Isotopic Analysis
as of May 2011

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I. Sample Identification and Information

Client: ENSAFE / Josh Teves

Date Received: 4/10/2015

Isotopes of Interest: ☑ Cl-37 ☑ Cl-36 ☑ O-18

Client Sample ID: Colton 17F

EIGL Lab ID: J-1703 G-2937

Column No.: 448

Estimated Perchlorate on column (mg): 14

Final Perchlorate recovered (mg): _____

Sample Description and Comments:

- column intact
- resin slightly gray

NCS / 6-25-15

EIGL ID: J-1703 Sample ID: Colton 17F Client: ENSAFE

II. Sonication:

a. Transfer resin into 250-mL beaker using 1.5 BV UP Di H_2O and sonicate for 3 minutes. Collect sonic washes in properly labeled 500-mL bottles. - not saved

b. Repeat step a. until sonic washes are clear.

By: NCS Date: 6-25-15

Comments: 1st rinse nearly clear
2nd rinse clear

III. Pre-Flush:

a. Transfer resin into 150-mL column using Di H_2O as necessary. Drain liquid up to the top of the resin and save the liquid together with the sonic washes. - not saved

b. Flush the resin with 4BV of 4M HCl at 5 mL/min. Collect the pre-flushes in appropriate, properly labeled bottles.

c. If resin is not immediately eluted, follow the acid with 1BV UP Di H_2O. Do not drain completely, leaving ~2 cm high H_2O above the resin. Collect the liquid with the pre-flushes.

By: NCS Date: 6-25-15

Comments: all O.K.

IV. Elution:

a. Elute the resin with 3BV of $FeCl_3$/HCl eluent at 2 mL/min. Collect the eluent in 1-L flasks.

b. Pass through 3BV of UP Di H_2O. Collect the liquid in the same flasks used for the eluent.

c. Dilute the eluent some more with 6BV of UP Di H_2O. Total dilution is 3x that of the eluent.

By: NCS Date: 6-26-15 Total volume: 300 ($FeCl_3$) + 300 DIW + 300 DIW + 300 DIW = 1,200 mL

Comments:
- resin floats, then settles
- elute after settling

V. Fe-removal:

a. Use column filled with cation resin having a volume 2x that of the eluent. Pass sample through the column and collect in beakers. Volume cation resin: 600 mL

b. Pass 3BV UP Di H_2O to rinse the cation resin and save in the same beaker with the Fe-removed solution.

By: NCS Date: 6-27-15 Total Volume: 600 (Fe) + ~~1800~~ 2400 DIW = ~~2400~~ 3000 mL

Comments:
- new AG50WX-12 resin; washed until ~clear with DIW
- load column, flush with 1 BV DIW
- minor Fe bleed-through at end of Fe solution load (last ~100 mL)

Clean-up cation resin:

BV 4M HCl: 1, +1, +0.33 = 2.33 BV then BV DIW = 1

EIGL ID: J-1703 Sample ID: Colton 17F Client: Ensafe

VI. Concentration:

✓ a. Add 1 mL concentrated H_2O_2. - no cover glass, 3000 mL bkr. - hot plate @ 5:25

✓ b. Cover the beaker with cover glass and put it on the hot plate for evaporation. - 500 mL / 3 hrs - reduce to ~~500~~ 4.50 @ 10:15 pm

– c. If samples are in multiple beakers, combine them in one beaker as soon as the solution is about 200 mL. - leave overnight

✓ d. Add another 1 mL concentrated H_2O_2.

✓ e. Once < 200 mL, transfer in 250-mL beaker. Continue evaporating until the volume is about 25 mL.

✓ f. Remove from the hot plate and let it cool down. Take an aliquot for IC analysis.

Dilution Factor: _____ ClO_4 (ppm): _____

ClO_4 (mg): _____

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 6-29-15

Comments: after cooling, - Sample evap'd to ~25 mL; had 2-mm white salt cubes that dissolved readily in H_2O. Diluted to ~75 mL

VII. Reload:

✓ a. Transfer sample into a 60-mL bottle. Rinse the walls of the beaker and collect them together with the sample solution.

✓ b. Dilute the sample solution with UP Di H_2O to ~40 mL.

✓ c. Add 2 mL of clean Purolite resin into the bottle containing the sample solution.

✓ d. Put on the shaker at low setting for at least an hour. @ 9:50 AM ~11:55 AM

✓ e. Pipet out the sample solution, leaving the loaded Purolite resin in the bottle.

✓ f. With the use of small volumes of UP Di H_2O, transfer the loaded Purolite resin into a small column with 2-mL of clean Purolite resin. Make sure to collect the UP Di H_2O together with the sample solution. Avoid air bubbles forming inside the column.

✓ g. Pass the sample solution through the small column, now with 4-mL Purolite resin at 1 mL/min.

By: NCS Date: 7-10-15 & 7-13-15

Comments: _____

VIII. Second flush

a. Pass 4 BV of 4 M HCl through the small column at 2 mL/min.

b. Collect HCl flushes in the same bottle that contains the reloaded sample solution.

BV

~~IIII~~

By: NCS Date: 7-13-15

Comments: _____

EIGL ID: J-1703 Sample ID: Colton 17F Client: Ensafe

IX. Elution of reload: 4M HCl

a. Using small volume of ~~UP Di H_2O~~, transfer the loaded Purolite resin into a 60-mL bottle.

b. Add 3BV of $FeCl_3$/HCl eluent and put on the shaker at low setting for 2 hours. @ 1:15 - 3:30

c. Pipet out the eluent into a 125-mL flask and leave the eluted Purolite resin in the bottle. Use a funnel with a filter paper to avoid any resin from mixing with the eluent in the flask.

d. Add a total of 3 BV (1 BV at a time) of UP Di H_2O into the bottle and shake. This will completely rinse the Purolite resin of the eluent.

e. Pipet out the rinse and add it together with the eluent in the 125-mL flask.

By: NCS Date: 7-14-15 Total volume: 30 mL

Comments:

X. Fe-removal:

a. Prepare small columns with cation resins twice the volume of eluent. Pass through the diluted eluent. Collect in appropriate beakers. Volume cation resin: 30 mL

b. Follow with 3BV UP Di H_2O.

By: NCS Date: 7-15-15 Total volume: ~ 150 mL (before loading)

Comments:

Note: diluted the eluent further w/ 2X volume DIW ~~following IX.e. to ensure Fe retention on~~ cation column.

XI. Concentration:

a. Cover the beaker and put on hot plate. ~~Add~~ 2 drops of H_2O_2. Evaporate to 10 mL.

b. Transfer solution to a Teflon ~~beaker~~. Rinse the walls of the glass ~~beaker and collect~~ together with the sample solution.

c. Evaporate further to <0.5 mL at low heat.

By: NCS Date: 7-17-15

Comments:

EVAP'd to DRYNESS!!

XII. Cl-removal

a. Prepare two Ag OnGuard ~~cartridges attached~~ together by flushing with 150 mL UP Di H_2O.

b. Prepare small columns with 3 mL cation resin flushed with 150 mL UP Di H_2O.

c. Once the sample solution is <0.5 mL, remove from hot plate and let it cool down. Dilute it to 3 mL with UP Di H_2O.

d. Using a syringe, pass the diluted solution through the attached Ag OnGuard cartridges into the small cation resin columns. Collect in 15-mL centrifuge tubes.

e. Flush the Ag onguards 2x with 2 mL UP Di H_2O into the cation resin columns. Collect in the same centrifuge tubes with the sample.

f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. Total Volume: _____ rinsed bkr from 14.0 mL

EIGL ID: J-1703* Sample ID: Colton 17F (a) Client: Ensafe

✓ g. Watch for possible precipitation. If solution is a little cloudy, let it sit overnight. Then proceed to XII.

h. If the sample solution is clear, take an aliquot for IC analysis.

Dilution Factor: ~~1mL in~~ 1:5 ClO_4 (ppm): _____

ClO_4 (mg): 1.03

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 8/13/15

Comments: _____

XIII. Final ion clean up before SPE

✓ a. If precipitation has occurred, centrifuge the samples to separate the precipitates from the solution.

✓ b. Prepare Ba-Ag-H OnGuard cartridges attached together in sequence by flushing through 150 mL UP Di H_2O.

✓ c. Prepare 3 mL cation resin column by flushing through 150 mL UP Di H_2O.

✓ d. Using a syringe, pass the centrifuged solution through the Ba-Ag-H OnGuard cartridges into the cation resin column. Collect in 50-mL centrifuge tubes.

✓ e. Flush the Ba-Ag-H OnGuard cartridges 2x with 3 mL UP Di H2O into the cation resin columns. Collect in the same centrifuge tubes with the sample. flush: II

✓ f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. flush: III Total Volume: 28.0 mL

✓ g. Take ~~3~~ 1 mL aliquot for IC analysis. 1 mL → 5 mL dilution 5X

Are other anions still present? ☑ YES ☐ NO < ClO_4^-

How much ClO_4 in the sample? — ppm or 0.9 mg

h. Return aliquot to the centrifuge tube. If possible, evaporate down the samples to 10 mL in the oven.

By: NCS Date: 8/24/15

Comments: _____

9/12/15 - added 180 µL 0.5M KOH = 0.09 mmol K^+ before evap. to dryness

EIGL ID: J-1703 Sample ID: Colton 17f Client: Ensafe

I. $TPAClO_4$ Precipitation:

a. Evaporate the sample to 0.5 mL and transfer into a clean 4-dram clear glass vial labeled as "SAMPLE ID TPA" by using a pipette.

b. Add 1mL of 0.1M Tetrapentylammonium Bromide (TPABr) per 1 mg of perchlorate into the glass vial containing the sample.

c. Cap the glass vial and place in the refrigerator for an hour to finish $TPAClO_4$ precipitation.

By: NCS Date: 9.23.15

Comments:

II. $TPAClO_4$ First UP DIW Rinse:

a. Label a new pre-cut 5 mL centrifuge-filter tube. Insert the uncapped glass vial into the mouth of the centrifuge-filter tube. Centrifuge at 2000 rpm for 3.5 minutes. Make sure that all the liquid has passed through the filter. Collect the supernatant in a separate 15-mL centrifuge tube labeled as "SAMPLE ID $TPAClO_4$ WASH."

b. Rinse the glass vial and centrifuge-filter tube with 1 mL of ice-cold UP DIW (~0°C). Gently shake the glass vial and then centrifuge similarly as in step II-a. Add the washes into the same 15-mL centrifuge wash tube in step II-a. Repeat ~~3X~~. 2X

c. Extensively rinse the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

d. Add acetone into the glass vial to dissolve the $TPAClO_4$. Then pipette the acetone carefully from the vial into the centrifuge-filter tube. Centrifuge as in step II-a. Transfer all acetone with dissolved $TPAClO_4$ into a new 4-dram clear glass vial labeled as "SAMPLE ID 0.5 mL." Mark the 0.5 mL level on the glass vial with a Sharpie. Repeat ~~3X~~. 2X

e. Put the glass vial with the dissolved $TPAClO_4$ inside the oven at 50°C overnight to evaporate the sample to dryness.

By: NCS Date: 9.23.15

Comments:

III. $TPAClO_4$ Second UP DIW Rinse:

a. Remove samples from the oven and let them cool down.

b. Add 200 µL acetone in the glass vial to dissolve all $TPAClO_4$ then add 1 mL UP DIW to re-precipitate $TPAClO_4$.

c. Put the samples inside the oven at 90°C to evaporate down to about 0.5 mL.

d. Remove the samples from the oven and cap them immediately. Place them in the refrigerator for at least 30 minutes.

e. Weigh new 4-dram clear glass vials (without cap) labeled as "SAMPLE ID $KClO_4$." Record the tare.

f. Remove the samples from the refrigerator and centrifuge similarly as in step II-a. Collect all supernatant in the same 15-mL centrifuge tube in step II-a.

g. Rinse $TPAClO_4$ precipitates similarly as in step II-b.

EIGL ID: J-1703* Sample ID: Colton 17f Client: Ensafe

h. Clean the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

i. Dissolve all $TPAClO_4$ similarly as in step II-d. Use the new 4-dram clear glass vials tarred in step III-e to collect all the acetone with dissolved $TPAClO_4$.

j. Place the samples inside the oven at 50°C overnight to evaporate to dryness.

By: NCS Date: 9/28/15

Comments:

IV. $TPAClO_4$ to $KClO_4$:

a. Remove the samples from the oven and cap immediately. Let them cool down to room temperature.

b. Weigh samples uncapped and subtract the tare weights to obtain the weight of $TPAClO_4$.

c. Add 200 µL of freshly made 0.5 M KOH in absolute ethanol per 1 mg of ClO_4 into each glass vial to precipitate $KClO_4$. Let it mature for an hour while mixing the precipitates a few times. Make sure that there are no big crystals stuck on the glass vial walls. Use a new yellow pipette tip to crush the crystals.

d. Put the capped glass vial upright in a 50-mL centrifuge tube wrapped with paper towel to protect the glass vial. Centrifuge at a maximum of 3500 rpm for 5 minutes.

e. Transfer the supernatant into a new and properly labeled pre-cut centrifuge-filter tube using a precision pipette (blue tip). Insert the glass vial into the centrifuge-filter tube and centrifuge similarly as in step II.a. Make sure that all the liquid has passed through the filter. Leave the supernatant in the liquid receiver of the centrifuge-filter tube.

f. Rinse the glass vial walls carefully with 200 µL absolute ethanol. Pipette the ethanol rinse from the glass vial into the centrifuge-filter tube. Insert the glass vial into the centrifuge-filter tube and centrifuge at 2000 rpm for 3.5 minutes. Leave the ethanol rinse in the liquid receiver of the centrifuge-filter tube. Repeat 4X. Transfer all the rinses in the liquid receiver to a new 4-dram clear glass vial labeled as "SAMPLE ID ETHANOL WASH."

g. Extensively rinse the liquid receiver of the centrifuge-filter tube with UP DIW to remove all traces of ethanol-KOH solution.

h. Leave open the centrifuge-filter tube, liquid receiver, and glass vial at room temperature covered from dust for at least 5 hours. This will evaporate any residual ethanol.

i. Dissolve all $KClO_4$ by rinsing the glass vial and centrifuge-filter tube with 1 mL of UP DIW and centrifuge as in step IV.f. Repeat 3X. Transfer all dissolved $KClO_4$ into a clean ~~IC vial~~ 15 mL cent tube labeled "SAMPLE ID $KClO_4$."

j. Run the sample on the IC to check the purity and amount of recovered ClO_4.

By: NCS Date: 9.28.15

Comments: diluted to 10 mL in DIW

EIGL ID: _____ Sample ID: _____ Client: _____

V. $KClO_4$ Second Ethanol Rinse:

a. Transfer the sample into new 15-mL centrifuge tube, properly labeled as "SAMPLE ID $KClO_4$ 2nd ETHANOL RINSE." Place centrifuge tubes uncapped in the oven at 80°C overnight to evaporate to dryness.

b. Once all $KClO_4$ has dried, take the sample out from the oven. Cap it and let it cool down to room temperature.

c. Add 200 µL absolute ethanol and crush the $KClO_4$ precipitates using the tip of the precision pipette. Let it sit for 10 minutes.

d. Shake the centrifuge tube by using the Vortex Mixer.

e. Centrifuge at 3000 RPM for 3.5 minutes. Pipette out the supernatant and save it in the same 4-dram clear glass vial in IV.f (SAMPLE ID ETHANOL WASH). Repeat V.c., d., and e. 3X.

f. Leave the centrifuge tube uncapped and protected from dust to evaporate out any remaining ethanol for at least an hour. If liquid ethanol is not visible anymore, place the centrifuge tubes in the oven at 50°C for 15 minutes to completely evaporate ethanol.

g. Take the samples out from the oven and dissolve all $KClO_4$ with 1 mL UP DIW. Pipette the dissolved $KClO_4$ out and transfer into a new 15-mL centrifuge tube labeled as "SAMPLE ID $KClO_4$ RECRYSTALLIZED."

h. Put the samples uncapped inside the oven at 80°C to evaporate to dryness overnight.

i. Tare IC vials and record this number.

j. Take the samples out from the oven. Dissolve $KClO_4$ crystals with 3 mL warm UP DIW and transfer into clean, labeled (SAMPLE ID KClO4 final), and tarred IC vial. Weigh the IC vial with the sample. Sample weight = (vial + sample weight) – tare vial weight. Run on the IC.

k. Once IC results are satisfactory, transfer into a labeled combustion tube. Place in an oven-pump to evaporate to dryness.

By: _____ Date: _____

Comments: _____

_____

_____

Environmental Isotope Geochemistry Laboratory
University of Illinois at Chicago

Extraction and Purification of Perchlorate for Isotopic Analysis
as of May 2011

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I. Sample Identification and Information

Client: ENSAFE / Josh Teves

Date Received: 4/10/2015

Isotopes of Interest: ☑ Cl-37 ☑ Cl-36 ☑ O-18

Client Sample ID: 5W13B5F280

EIGL Lab ID: J-1704 G-2938

Column No.: #447

Estimated Perchlorate on column (mg): 14

Final Perchlorate recovered (mg): _____

Sample Description and Comments:

- column intact
- resin slightly gray

NKS / 6-25-15

EIGL ID: J-1704 Sample ID: 5W13B5F280 Client: ENSAFE

II. Sonication:

a. Transfer resin into 250-mL beaker using 1.5 BV UP Di H_2O and sonicate for 3 minutes. Collect sonic washes in properly labeled 500-mL bottles. - not saved

b. Repeat step a. until sonic washes are clear.

By: NCS Date: 6-25-15

Comments: 1st wash slightly turbid & "sudsy"
2ND wash better; 3rd wash still slightly turbid
4th almost clear; 5th wash clear

III. Pre-Flush:

a. Transfer resin into 150-mL column using Di H_2O as necessary. Drain liquid up to the top of the resin and save the liquid together with the sonic washes.

b. Flush the resin with 4BV of 4M HCl at 5 mL/min. Collect the pre-flushes in appropriate, properly labeled bottles.

c. If resin is not immediately eluted, follow the acid with 1BV UP Di H_2O. Do not drain completely, leaving ~2 cm high H_2O above the resin. Collect the liquid with the pre-flushes.

By: NCS Date: 6-25-15

Comments: all O.K.

IV. Elution:

a. Elute the resin with 3BV of $FeCl_3$/HCl eluent at 2 mL/min. Collect the eluent in 1-L flasks.

b. Pass through 3BV of UP Di H_2O. Collect the liquid in the same flasks used for the eluent.

c. Dilute the eluent some more with 6BV of UP Di H_2O. Total dilution is 3x that of the eluent.

By: NCS Date: 6-26-15 Total volume: 300 ($FeCl_3$) + 300 DIW + 300 DIW + 300 DIW = 1,200 mL

Comments:
- resin floats, then settles
- elute after settling

V. Fe-removal:

a. Use column filled with cation resin having a volume 2x that of the eluent. Pass sample through the column and collect in beakers. Volume cation resin: 600 mL

b. Pass 3BV UP Di H_2O to rinse the cation resin and save in the same beaker with the Fe-removed solution.

By: NCS Date: 6-27-15 Total Volume: 600 (Fe) + ~~1,800~~ 2,400 DIW = ~~2,400 mL~~ 3,000 mL

Comments:
- new AG50W-X12 resin: washed w/ DIW until clear
- load column, flush w/ 1 BV DIW
- minor Fe bleed through at end of Fe solution load (last ~100 mL)

Clean-up cation resin:

BV 4M HCl: 1, +1, +0.33 = 2.33 BV BV H_2O: 1 D.I.

EIGL ID: J-1704 Sample ID: 5W13B5F280 Client: ENSAFE

VI. Concentration:

- hot plate @ 5.25
- 500 mL / 3 hrs.
- reduce to ~~500~~ 4.50 @ 10:15 pm
- leave overnight

✓ a. Add 1 mL concentrated H_2O_2.

✓ b. Cover the beaker with cover glass and put it on the hot plate for evaporation. - no cover glass, 3000 mL bkr.

– c. If samples are in multiple beakers, combine them in one beaker as soon as the solution is about 200 mL.

✓ d. Add another 1 mL concentrated H_2O_2.

✓ e. Once < 200 mL, transfer in 250-mL beaker. Continue evaporating until the volume is about 25 mL.

✓ f. Remove from the hot plate and let it cool down. Take an aliquot for IC analysis.

Dilution Factor: _____ ClO_4 (ppm): _____

ClO_4 (mg): _____

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 6-29-15

Comments:

- sample evap'd to ~20 mL & cooled
- diluted to ~50 mL -- no precipitates

VII. Reload:

✓ a. Transfer sample into a 60-mL bottle. Rinse the walls of the beaker and collect them together with the sample solution.

✓ b. Dilute the sample solution with UP Di H_2O to ~40 mL.

✓ c. Add 2 mL of clean Purolite resin into the bottle containing the sample solution.

✓ d. Put on the shaker at low setting for at least an hour. @ 9:50 AM ~ 11:55 AM

✓ e. Pipet out the sample solution, leaving the loaded Purolite resin in the bottle.

✓ f. With the use of small volumes of UP Di H_2O, transfer the loaded Purolite resin into a small column with 2-mL of clean Purolite resin. Make sure to collect the UP Di H_2O together with the sample solution. Avoid air bubbles forming inside the column.

✓ g. Pass the sample solution through the small column, now with 4-mL Purolite resin at 1 mL/min.

By: NCS Date: 7-10-15 & 7-13-15

Comments:

VIII. Second flush

a. Pass 4 BV of 4 M HCl through the small column at 2 mL/min.

b. Collect HCl flushes in the same bottle that contains the reloaded sample solution.

By: NCS Date: 7-13-15

Comments:

#BV
~~IIII~~

EIGL ID: J-1704 Sample ID: 5W13B5F280 Client: Ensafe

IX. Elution of reload: 4M HCl

a. Using small volume of ~~UP Di H_2O~~, transfer the loaded Purolite resin into a 60-mL bottle.

b. Add 3BV of $FeCl_3$/HCl eluent and put on the shaker at low setting for 2 hours. @ 1:15 - 3:30

c. Pipet out the eluent into a 125-mL flask and leave the eluted Purolite resin in the bottle. Use a funnel with a filter paper to avoid any resin from mixing with the eluent in the flask.

d. Add a total of 3 BV (1 BV at a time) of UP Di H_2O into the bottle and shake. This will completely rinse the Purolite resin of the eluent.

e. Pipet out the rinse and add it together with the eluent in the 125-mL flask.

By: NCS Date: 7-14-15 Total volume: 30 mL

Comments:

X. Fe-removal:

a. Prepare small columns with cation resins twice the volume of eluent. Pass through the diluted eluent. Collect in appropriate beakers. Volume cation resin: 30 mL

b. Follow with 3BV UP Di H_2O.

By: NCS Date: 7-15-15 Total volume: ~~B~~ ~150 mL

Comments: See J-1703

XI. Concentration:

a. Cover the beaker and put on hot plate. Add 2 drops of H_2O_2. Evaporate to 10 mL.

b. Transfer solution to a Teflon beaker. Rinse the walls of the glass beaker and collect together with the sample solution.

7/24/15 c. Evaporate further to <0.5 mL at low heat.

By: NCS Date: 7-17-15

Comments:

7/27/15 XII. Cl-removal

a. Prepare two Ag OnGuard cartridges attached together by flushing with ~~150~~ 60 mL UP Di H_2O.

b. Prepare small columns with 3 mL cation resin flushed with 150 mL UP Di H_2O.

c. Once the sample solution is <0.5 mL, remove from hot plate and let it cool down. Dilute it to 3 mL with UP Di H_2O.

d. Using a syringe, pass the diluted solution through the attached Ag OnGuard cartridges into the small cation resin columns. Collect in 15-mL centrifuge tubes.

e. Flush the Ag onguards 2x with 2 mL UP Di H_2O into the cation resin columns. Collect in the same centrifuge tubes with the sample.

f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. Total Volume: 13.5 mL

BV (2 ml)

111

EIGL ID: J-1704 Sample ID: 5w --- Client: Ensafe

g. Watch for possible precipitation. If solution is a little cloudy, let it sit overnight. Then proceed to XII.

h. If the sample solution is clear, take an aliquot for IC analysis.

Dilution Factor: 5 ClO_4 (ppm): _____

ClO_4 (mg): 0.23

Don't forget to return the aliquot to the rest of the sample solution.

By: NCS Date: 8/13/15

Comments: _____

XIII. Final ion clean up before SPE

✓ a. If precipitation has occurred, centrifuge the samples to separate the precipitates from the solution.

✓ b. Prepare Ba-Ag-H OnGuard cartridges attached together in sequence by flushing through 150 mL UP Di H_2O.

✓ c. Prepare 3 mL cation resin column by flushing through 150 mL UP Di H_2O.

✓ d. Using a syringe, pass the centrifuged solution through the Ba-Ag-H OnGuard cartridges into the cation resin column. Collect in 50-mL centrifuge tubes.

✓ e. Flush the Ba-Ag-H OnGuard cartridges 2x with 3 mL UP Di H2O into the cation resin columns. Collect in the same centrifuge tubes with the sample. flush: II

✓ f. Flush the cation resin columns 3x with 2 mL UP Di H_2O. Collect in the same centrifuge tubes with the sample. flush: III Total Volume: 28.0 mL

✓ g. Take 3 mL aliquot for IC analysis. 1 mL → 5 mL dilution (5x)

Are other anions still present? ☑ YES ☐ NO < SO_4

How much ClO_4 in the sample? – ppm or 0.24 mg

h. Return aliquot to the centrifuge tube. If possible, evaporate down the samples to 10 mL in the oven.

By: NCS Date: 8/24/15

Comments: _____

9/12/15 - added 80 µL 0.5M KOH = 0.04 mmol K^+ before evap to dryness

EIGL ID: J-1704 Sample ID: 5W13- Client: Ensafe

I. $TPAClO_4$ Precipitation:

✓ a. Evaporate the sample to 0.5 mL and transfer into a clean 4-dram clear glass vial labeled as "SAMPLE ID TPA" by using a pipette.

✓ b. Add 1mL of 0.1M Tetrapentylammonium Bromide (TPABr) per 1 mg of perchlorate into the glass vial containing the sample.

✓ c. Cap the glass vial and place in the refrigerator for an hour to finish $TPAClO_4$ precipitation.

By: NCS Date: 9.23.14

Comments:

II. $TPAClO_4$ First UP DIW Rinse:

✓ a. Label a new pre-cut 5 mL centrifuge-filter tube. Insert the uncapped glass vial into the mouth of the centrifuge-filter tube. Centrifuge at 2000 rpm for 3.5 minutes. Make sure that all the liquid has passed through the filter. Collect the supernatant in a separate 15-mL centrifuge tube labeled as "SAMPLE ID $TPAClO_4$ WASH."

✓ b. Rinse the glass vial and centrifuge-filter tube with 1 mL of ice-cold UP DIW (~0°C). Gently shake the glass vial and then centrifuge similarly as in step II-a. Add the washes into the same 15-mL centrifuge wash tube in step II-a. Repeat ~~3X.~~ 2X

✓ c. Extensively rinse the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

✓ d. Add acetone into the glass vial to dissolve the $TPAClO_4$. Then pipette the acetone carefully from the vial into the centrifuge-filter tube. Centrifuge as in step II-a. Transfer all acetone with dissolved $TPAClO_4$ into a new 4-dram clear glass vial labeled as "SAMPLE ID 0.5 mL." Mark the 0.5 mL level on the glass vial with a Sharpie. Repeat ~~3X.~~ 2X

✓ e. Put the glass vial with the dissolved $TPAClO_4$ inside the oven at 50°C overnight to evaporate the sample to dryness.

By: NCS Date: 9.23.15

Comments:

III. $TPAClO_4$ Second UP DIW Rinse:

✓ a. Remove samples from the oven and let them cool down.

✓ b. Add 200 µL acetone in the glass vial to dissolve all $TPAClO_4$ then add 1 mL UP DIW to re-precipitate $TPAClO_4$.

✓ c. Put the samples inside the oven at 90°C to evaporate down to about 0.5 mL.

✓ d. Remove the samples from the oven and cap them immediately. Place them in the refrigerator for at least 30 minutes.

✓ e. Weigh new 4-dram clear glass vials (without cap) labeled as "SAMPLE ID $KClO_4$." Record the tare.

✓ f. Remove the samples from the refrigerator and centrifuge similarly as in step II-a. Collect all supernatant in the same 15-mL centrifuge tube in step II-a.

✓ g. Rinse $TPAClO_4$ precipitates similarly as in step II-b.

EIGL ID: J.1704 Sample ID: 5W13 - Client: Ensafe

h. Clean the centrifuge-filter tube's liquid receiver with 4 bed volume of acetone to remove any excess TPA. Discard the rinses.

i. Dissolve all $TPAClO_4$ similarly as in step II-d. Use the new 4-dram clear glass vials tarred in step III-e to collect all the acetone with dissolved $TPAClO_4$.

j. Place the samples inside the oven at 50°C overnight to evaporate to dryness.

By: NCS Date: 9/28/15

Comments:

IV. $TPAClO_4$ to $KClO_4$:

a. Remove the samples from the oven and cap immediately. Let them cool down to room temperature.

b. Weigh samples uncapped and subtract the tare weights to obtain the weight of $TPAClO_4$.

c. Add 200 µL of freshly made 0.5 M KOH in absolute ethanol per 1 mg of ClO_4 into each glass vial to precipitate $KClO_4$. Let it mature for an hour while mixing the precipitates a few times. Make sure that there are no big crystals stuck on the glass vial walls. Use a new yellow pipette tip to crush the crystals.

d. Put the capped glass vial upright in a 50-mL centrifuge tube wrapped with paper towel to protect the glass vial. Centrifuge at a maximum of 3500 rpm for 5 minutes.

e. Transfer the supernatant into a new and properly labeled pre-cut centrifuge-filter tube using a precision pipette (blue tip). Insert the glass vial into the centrifuge-filter tube and centrifuge similarly as in step II.a. Make sure that all the liquid has passed through the filter. Leave the supernatant in the liquid receiver of the centrifuge-filter tube.

f. Rinse the glass vial walls carefully with 200 µL absolute ethanol. Pipette the ethanol rinse from the glass vial into the centrifuge-filter tube. Insert the glass vial into the centrifuge-filter tube and centrifuge at 2000 rpm for 3.5 minutes. Leave the ethanol rinse in the liquid receiver of the centrifuge-filter tube. Repeat 4X. Transfer all the rinses in the liquid receiver to a new 4-dram clear glass vial labeled as "SAMPLE ID ETHANOL WASH."

g. Extensively rinse the liquid receiver of the centrifuge-filter tube with UP DIW to remove all traces of ethanol-KOH solution.

h. Leave open the centrifuge-filter tube, liquid receiver, and glass vial at room temperature covered from dust for at least 5 hours. This will evaporate any residual ethanol.

i. Dissolve all $KClO_4$ by rinsing the glass vial and centrifuge-filter tube with 1 mL of UP DIW and centrifuge as in step IV.f. Repeat 3X. Transfer all dissolved $KClO_4$ into a clean ~~IC vial~~ 15 mL Cent tube labeled "SAMPLE ID $KClO_4$."

j. Run the sample on the IC to check the purity and amount of recovered ClO_4.

By: NCS Date: 9-28-15

Comments: diluted to 10 mL in DIW

EIGL ID: _____ Sample ID: _____ Client: _____

V. $KClO_4$ Second Ethanol Rinse:

a. Transfer the sample into new 15-mL centrifuge tube, properly labeled as "SAMPLE ID $KClO_4$ 2nd ETHANOL RINSE." Place centrifuge tubes uncapped in the oven at 80°C overnight to evaporate to dryness.

b. Once all $KClO_4$ has dried, take the sample out from the oven. Cap it and let it cool down to room temperature.

c. Add 200 µL absolute ethanol and crush the $KClO_4$ precipitates using the tip of the precision pipette. Let it sit for 10 minutes.

d. Shake the centrifuge tube by using the Vortex Mixer.

e. Centrifuge at 3000 RPM for 3.5 minutes. Pipette out the supernatant and save it in the same 4-dram clear glass vial in IV.f (SAMPLE ID ETHANOL WASH). Repeat V.c., d., and e. 3X.

f. Leave the centrifuge tube uncapped and protected from dust to evaporate out any remaining ethanol for at least an hour. If liquid ethanol is not visible anymore, place the centrifuge tubes in the oven at 50°C for 15 minutes to completely evaporate ethanol.

g. Take the samples out from the oven and dissolve all $KClO_4$ with 1 mL UP DIW. Pipette the dissolved $KClO_4$ out and transfer into a new 15-mL centrifuge tube labeled as "SAMPLE ID $KClO_4$ RECRYSTALLIZED."

h. Put the samples uncapped inside the oven at 80°C to evaporate to dryness overnight.

i. Tare IC vials and record this number.

j. Take the samples out from the oven. Dissolve $KClO_4$ crystals with 3 mL warm UP DIW and transfer into clean, labeled (SAMPLE ID KClO4 final), and tarred IC vial. Weigh the IC vial with the sample. Sample weight = (vial + sample weight) – tare vial weight. Run on the IC.

k. Once IC results are satisfactory, transfer into a labeled combustion tube. Place in an oven-pump to evaporate to dryness.

By: _____ Date: _____

Comments: _____

_____

_____

CB & I

17 Princess Road
Lawrenceville, NJ 08648
Tel: 609/895-5370
Fax: 609/895-1858

#461
needs
2.5cc Ag on-guard
w/ H on-guard

Reduced Deliverable Package

Prepared for
Neil Sturchio

Lab ID
RD1859

Project Number:

Samples Received
27-Aug-15

Report
3-Sep-15

NJDEP Certified Lab 11001

Randi Rothmel

Digitally signed by Randi Rothmel
DN: cn=Randi Rothmel, o=CBI FS, ou, email=randi.rothmel@cbifederalservices.com, c=US
Date: 2015.09.03 10:49:01 -04'00'

9/3/2015

Randi K Rothmel, PhD **Date**
Laboratory Director

1.0 General Information

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1.0 General Information

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Chain of Custody (s)

17 Princess Rd
Lawrenceville, NJ 08648
609-895-5370/ 609-895-1858
CB&I - Federal Services, LLC

CHAIN OF CUSTODY

Ref. Document # _____ Page _____ of _____

Lab ID = lab ID 1859 ☐ R&D

Project Contact: Paul Hatzinger (Name & phone #)

Send Report To: P. Hatzinger
Phone/Fax Number:
Address: (as above)
City/State:

Project Number/Cost code: 501402255/20120002
Project Name / Location: R+D /
Purchase Order #: /

Shipment Date:
Waybill/Airbill Number:
Lab Destination:
Lab Contact Name / ph. #:

Sampler's Name(s):

Lab No.	Sample ID Number	Sample Description	Collection Information Date	Time	G/C	Matrix	# of containers	Container size	Preservative HCL	NaOH	HNO_3	H_2SO_4	Ice	Analyses Requested: Perchlorate	Anions						Any Additional Information	Turn Around Time Requested
1	J-1703	GW				Aq	1	20						X	X							
2	J-1704	↓				↓	↓	↓						X	X							
3	#453	↓				↓	↓	↓						X	X							
4	#457	↓				↓	↓	↓						X	X							
5	#460	↓				↓	↓	↓						X	X							
6	#461	↓				C	↓	↓						X	X							

Special Instructions:

Known Waste Stream Circle:
RCRA PCB/dioxin PAH/oil RAD Corrosive Flammable Reactive

QC/Data Package Level Required:
I II III IV NJ EDD GIS EDD Preliminary data

Relinquished By:	Date:	Received By: Date: 8/27/15 Time: 7:30
Relinquished By:	Date:	Received By: Date:
Relinquished By:	Date:	Received By: Date:

G/C Codes
C = Composite G = Grab

QC Package Codes
Level I = data summary
Level II = data summary + basic QC
Level III = New Jersey QC reduced deliverable
Level IV = Full deliverable CLP package

Cooler temperature upon arrival at Lab:

Instructions: Do not Fill Shaded Areas; Check R&D Box if R&D samples Only

sercon
The Stable Isotope Company

www.sercongroup.com

#	sample name	~ ClO_4 PPM
6	J-1703*	16
7	J-1704	3.5
8	#453	15
9	#457	21
10	#460	21
11	#461	50

impurities are most likely Cl^-, NO_3^-, $SO_4^=$

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GEOLOGY
222 S CHAPEL ST RM 133
NEWARK, DE 197164701
UNITED STATES US

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ACTWGT: 0.7 LB
CAD: /OFFC1601
DIMS: 11x6x6 IN

BILL SENDER

TO PAUL HATZINGER
CB & I
17 PRINCESS RD

LAWRENCE TOWNSHIP NJ 08648
(609) 895-5366 REF:
INV:
PO: DEPT:

FedEx Express

WED - 26 AUG AA
STANDARD OVERNIGHT

TRK# 0215 8060 3734 2491

E2 PRIA

08648
NJ-US EWR

RT B39 8 B
ST 38 16:00 2491
08.26

Samples - sent Room Temp in a Box arrive 12:30 8/26/15 1 Stashelf in Stratton Rack

For Anions and Perchlorate

FedEx Express Package US Airbill

FedEx Tracking Number 8060 3734 2491

Form ID No. 0[illegible]

1 From

Date 8/25/15 [redacted]

Sender's Name Neil Sturchio Phone 302 831-8706

Company UNIVERSITY OF DELAWARE/GEOL SCIENCES

Address [illegible] ACADEMY STREET

Dept./Floor/Suite/Room

City NEWARK State DE ZIP 19716

2 Your Internal Billing Reference

[illegible]

3 To

Recipient's Name Paul Hatzinger Phone 609 895-5356

Company CB&I

Address 17 Princess Road

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Dept./Floor/Suite/Room

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Use this line for the HOLD location address or for continuation of your shipping address.

City Lawrenceville State NJ ZIP 08648

☐ HOLD Weekday — FedEx location address REQUIRED. NOT available for FedEx First Overnight.

☐ HOLD Saturday — FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

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8060 3734 2491

4 Express Pack[illegible]

NOTE: Service order has [illegible] *To most locations. [illegible] carefully.

Packages up to 150 lbs. For packages over 150 lbs., use the FedEx Express Freight US Airbill.

Next Business Day

☐ FedEx First Overnight — Earliest next business morning delivery to select locations. Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.

☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.

☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.

For 2 Business Days

☐ FedEx 2Day A.M. — Second business morning. Saturday Delivery NOT available.

☐ FedEx 2Day — Second business afternoon.

☐ [illegible]

5 Packaging *Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling and Delivery Signature Options

☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx 2Day A.M., or FedEx Express Saver.

☐ No Signature Required — Package may be left without obtaining a signature for delivery.

☐ Direct Signature — Someone at recipient's address may sign for delivery. Fee applies.

☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. Fee applies.

Does this shipment contain dangerous goods?

One box must be checked.

☒ No

☐ Yes — As per attached Shipper's Declaration.

☐ Yes — Shipper's Declaration not required.

☐ Dry Ice — Dry ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

☐ Cargo Aircraft Only

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☒ Sender — Acct. No. in Section 1 will be billed.

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☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

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[redacted]

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Methodology Review

Volatile Organics

Unless otherwise specified, water samples are analyzed for volatile organics by purge and trap GC/MS as specified in EPA Method 8260b. Soil samples are prepared by 5035- methanol extraction prior to analysis by 5030. GC/MS nontargeted compounds are analyzed for only upon request using a library search of the EPA/NIST05 mass spectral library of compounds at the greatest apparent concentrations (>10%of the nearest internal standard) for a total of 10 hits.

Other Organics

Other Organics such as alcohols, and dissolved gases (methane,ethane, ethene, propane) are analyzed using EPA methods 8015 or RSK-175 unless specified. Dissolved Hydrogen is analysed by RSK-175 using a GC equiped with a PDHID detector. Dissolved gases are prepared by a modification of Kampbell, and Vandegrift(Journal of Chromatographic Science, 1998, Vol 38, p253-256. Volatile fatty acids (acetate, formate, butyrate, proprionate) are analyzed by ion chromatography. Nitroaromatics are analyzed using Method 8330.

All Microbiology and Inorganic analysis is done by standard methods as specified in Test Method for Evaluating Solid Wastes, SW846, on line methods; EPA methods and Guidance of Analysis of Water, 1999; or Standard Methods for the examination of Water and Wastewater, 20th ed.

Microbiology

	Parameter	Method Code (s)
	Total Heterotrophs	SM9215C
	Specific Heterotrophs	SM9215C-BSM
	Biological Oxygen Demand	EPA405.1 SM5210B
	Biological Oxygen Demand, Carbon	SM5210B SM5210B
Wet Chemistry -Inorganics		
	Anions (Fl,Cl, Br, NO3,NO2,PO4, SO4)	EPA300.0
	Perchlorate,sol	EPA314.0
	Chlorate,sol	EPA300.0m
	Ammonia as NH3-N	EPA350.2 SM4500-NH3 B+C
	TKN	EPA351.3 SM4500-OrgB/C
	Alkalinity as CaCO3	EPA310.1 SM2320B
	Hardness as CaCO3	EPA130.2 SM2340 B/C
	Carbon Dioxide	SM4500-CO2
	Total Organic Carbon	EPA415.1 SM5310 B,C,D; SW-846 9060
	Chemical Oxygen Demand	EPA410.4 SM5220D
	pH	EPA150.1 SM4500-H B; SW-846 9045C
	Total Dissolved Solids (TDS)	EPA160.1 SM2540 C
	Total Solids	EPA160.3 SM2540 B
	Total Suspended Solids (TSS)	EPA160.2 SM2540 D
	Volatile Suspended Solids (VSS)	EPA160.4 SM2540G
	Turbidity	EPA180.1 SM2130 B
	Conductivity	EPA120.1 SW-846 9050A
	Phosphorus (all forms)	EPA365.2 SM4500-P
	Total Resdual Chlorine	EPA330.5 SM4500-Cl G
Organics		
	Methane ethane ethene	EPA3810, RSK-175
	Volatile fatty acids	IC, EPA300m
	Alcohols (methanol, ethanol etc)	SW846-8015

Reporting Qualifiers

U- The compound was not detected at the indicated PQL concentration.

J- Approximate concentration of the compound. Detection of compound above calculated MDL but below the PQL of the analytical method. 99% confidence that the compound is present.

D- Diluted sample

B- The analyte was observed in laboratory blank as well as the sample - for EPA SW856 8260b and EPA 624 analysis

E- Compound detected above the linear range of the curve. Value given is an estimated value.

2.0 Sample Results

Chicago Bridge and Iron
Analytical and Treatability Laboratories

17 Princess Road
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Tel; 609/895-5370
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Sample Information			
Lab ID	**RD1859-01**	**Date Sampled**	
Sample ID	**J-1703**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	amount	*Date Analyzed*	*Concentration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride		08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride	22.4 µg	08/27/2015	0.16	J	mg/L	0.2	0.015	1	EPA 300.0
Nitrite as N		08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4	258 µg	08/27/2015	1.84		mg/L	0.2	0.024	1	EPA 300.0
Bromide		08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N		08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate		08/27/2015	0.2	U	mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho		08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol	0.896 mg	09/01/2015	6,400	D	ug/L	500.0	138.000	1,000	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

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Sample Information			
Lab ID	**RD1859-02**	**Date Sampled**	
Sample ID	**J-1704**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	*Date Analyzed*	*Concentration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride 417 µg	08/27/2015	2.98		mg/L	0.2	0.015	1	EPA 300.0
Nitrite as N	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4 262 µg	08/27/2015	1.87		mg/L	0.2	0.024	1	EPA 300.0
Bromide	08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N	08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate	08/27/2015	0.2	U	mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho	08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol 0.244 mg	09/01/2015	1,740	D	ug/L	500.0	138.000	1,000	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

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Sample Information			
Lab ID	**RD1859-03**	**Date Sampled**	
Sample ID	**#453**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	*Date Analyzed*	*Concen tration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride 140 mg	08/27/2015	1.00		mg/L	0.2	0.015	1	EPA 300.0
Nitrite as N	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4 242 mg	08/27/2015	1.73		mg/L	0.2	0.024	1	EPA 300.0
Bromide ~~2~~	08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N	08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate	08/27/2015	0.2	U	mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho	08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol 1.04 mg	09/01/2015	7,430	D	ug/L	500.0	138.000	1,000	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

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Sample Information			
Lab ID	**RD1859-04**	**Date Sampled**	
Sample ID	**#457**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	*Date Analyzed*	*Concentration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride 206 µg	08/27/2015	1.47		mg/L	0.2	0.015	1	EPA 300.0
Nitrite as N	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4 266 µg	08/27/2015	1.90		mg/L	0.2	0.024	1	EPA 300.0
Bromide	08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N	08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate	08/27/2015	0.13	J	mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho	08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol 1.31 mg	09/01/2015	9,330	D	ug/L	500.0	138.000	1,000	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

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Sample Information			
Lab ID	**RD1859-05**	**Date Sampled**	
Sample ID	**#460**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	*Date Analyzed*	*Concentration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride 195 mg	08/27/2015	1.39		mg/L	0.2	0.015	1	EPA 300.0
Nitrite as N	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4 226 mg	08/27/2015	1.59		mg/L	0.2	0.024	1	EPA 300.0
Bromide	08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N	08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate	08/27/2015	0.16	J	mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho	08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol 1.41 mg	09/01/2015	10,100	D	ug/L	500.0	138.000	1,000	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

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Sample Information			
Lab ID	**RD1859-06**	**Date Sampled**	
Sample ID	**#461**	**Date Received**	08/27/2015
Matrix	***Aqueous***		

Limited Chemistry

Parameter	*Date Analyzed*	*Concentration*	*Qual (see below)*	*Units*	*PQL*	*MDL*	*Dilution Factor*	*Method Code*
Fluoride	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Chloride 94.4 mg	09/03/2015	674	D	mg/L	4.0	0.300	20	EPA 300.0
Nitrite as N	08/27/2015	0.2	U	mg/L	0.2	0.013	1	EPA 300.0
Sulfate as SO4 438 mg	08/27/2015	3.13		mg/L	0.2	0.024	1	EPA 300.0
Bromide	08/27/2015	0.2	U	mg/L	0.2	0.037	1	EPA 300.0
Nitrate as N	08/27/2015	0.2	U	mg/L	0.2	0.008	1	EPA 300.0
Chlorate	08/27/2015	0.27		mg/L	0.2	0.026	1	EPA 300.0
Phosphate as P, ortho	08/27/2015	0.2	U	mg/L	0.2	0.015	1	EPA 300.0
Perchlorate,sol 3.2 mg	09/01/2015	22,800		ug/L	0.5	0.138	1	EPA 314.0
Perchlorate,sol (dup)	09/02/2015	23,000		ug/L	0.5	0.138	1	EPA 314.0

NJDEP certified Lab ID 11001.
(1) Not listed as a Certified paramaters under the NJDEP lab certification program.
(2) Not available as a certified parameter under the NJDEP lab certification program.
( ) no qualification - sample run undiluted
(U) Compound not detected above method practical quantitation limit.
(D) Sample analyzed at indicated dilution
(J) Estimated value above MDL and less than PQL
(E) Estimated value beyond linear range

3.0 QC Summary

Sample Batch:Perchlorate

Lab ID	Analysis dates
RD1859- 1	9/2/2015
RD1859- 2	9/2/2015
RD1859- 3	9/2/2015
RD1859- 4	9/2/2015
RD1859- 5	9/2/2015
RD1859- 6	9/2/2015

Initial Calibration Summary:ClO4

Calibration Standard recoveries:

Initial Calibration Date: 8/26/2015

Sample:	Std ug/l	observed ug/L	% recovery
cal standard	0.2	0.179	89.6
cal standard	0.5	0.467	93.4
cal standard	1	0.829	82.9
cal standard	5	4.56	91.2
cal standard	50	57.4	114.8
cal standard	200	199	99.6

r2= 0.99918

QCCheck Date: 8/26/2015

Sample:	Std ppB	observed ppb	% recovery	Control Limits
QC Check	20.0	19.23	96.2	80.0-120.0%

Method Blank Summary:ClO4

Sample	Date	Concentration	Units	PQL
Blank	8/26/2015	u	ug/L	0.2

u: Compound not detected above Practical Quantitation Limit (PQL).

Calibration Verification Summary:Perchlorate

Check Standard recoveries:

Sample:	Date	Std ug/l	observed ug/L	% recovery
check standard	9/1/2015	100	94.99	95.0
	9/2/2015	10	8.31	83.1

Control Limits: 72.57-128.5%

QC Check:

Sample:	Date	Std ug/l	observed ug/L	% recovery
QC Check	9/2/2015	20	22.04	110.2

Control Limits: 72.57-128.5%

Method Blank Summary:Perchlorate

Sample	Date	Concentration	Units	PQL
Blank	9/1/2015	u	ug/L	0.2
Blank	9/2/2015	u	ug/L	0.2

u: Compound not detected above Practical Quantitation Limit (PQL).

Instrument Preformance Summary:Perchlorate

Sample	Date	Std ug/l	observed ug/L	% recovery
LSSM	9/1/2015	100	88.2	88.2

Control Limits: 69.32-124.21%

Method Duplicates Summary:Perchlorate

Sample:	9517-19			
	Date	MS Result	MSD Result	Units
Batch MS/MSD	9/1/2015	17.35	16.27	ug/L
		RPD=	6.4%	
		% Max RPD=	19.4%	

Method Spike Summary:Perchlorate

Sample:	9517-19			
	Date	MS Recovery	MSD Recovery	Control Limits
Batch MS/MSD	9/1/2015	86.8%	81.4%	71.84-137.67%

Sample Batch: Anions

Lab ID	Analysis date	
RD1859- 1	8/27/2015	
RD1859- 2	8/27/2015	
RD1859- 3	8/27/2015	
RD1859- 4	8/27/2015	
RD1859- 5	8/27/2015	
RD1859- 6	8/27/2015	9/3/2015

Initial Calibration Summary: Anions

Calibration Standard recoveries:

Initial Calibration Date: 7/18/2015

Sample:							
Std ppm		0.2	0.5	1.0	5.0	20.0	R^2=
Fluoride		0.1566	0.495	1.042	5.571	19.470	
	%rec	78.3	99.0	104.2	111.4	97.4	0.99848
Chloride*		0.1411	0.4376	0.901	4.796	20.71	
	%rec	70.6	87.5	90.1	95.9	103.6	0.99996
Nitrite		0.238	0.627	1.225	5.319	16.810	
	%rec	118.8	125.5	122.5	106.4	84.1	0.99858
Sulfate*		0.2971	0.608	1.044	5.017	21.090	
	%rec	148.6	121.6	104.4	100.3	105.5	0.99904
Bromide		0.155	0.425	0.843	4.502	20.170	
	%rec	77.4	85.0	84.3	90.0	100.9	0.99972
Nitrate		0.167	0.456	0.929	4.888	20.060	
	%rec	83.5	91.1	92.9	97.8	100.3	0.99999
Chlorate		0.292	0.538	0.953	4.615	20.280	
	%rec	146.0	107.5	95.3	92.3	101.4	0.99953
Phosphate		0.303	0.522	0.963	4.809	20.110	
	%rec	151.7	104.3	96.3	96.2	100.6	0.99984

*linear to 50.0ppm

QC Check Date: 7/18/2015

Sample:	Std ppm	Obs ppm	% recovery	Control Limits
QC Check-Fluoride	2.0	2.204	110.2%	80.0-120.0%
QC Check-Chloride	2.0	1.897	94.8%	80.0-120.0%
QC Check-Nitrite	2.0	2.400	120.0%	80.0-120.0%
QC Check-Sulfate	2.0	2.149	107.5%	80.0-120.0%
QC Check-Bromide	2.0	1.841	92.1%	80.0-120.0%
QC Check-Nitrate	2.0	1.935	96.8%	80.0-120.0%
QC Check-Chlorate	2.0	1.909	95.5%	80.0-120.0%
QC Check-Phosphate	2.0	1.925	96.3%	80.0-120.0%

Method Blank Summary: Anions

Sample	Date	Concentration	Units	PQL
Blank-Fluoride	7/18/2015	u	ppm	0.2
Blank-Chloride	7/18/2015	u	ppm	0.2
Blank-Nitrite	7/18/2015	u	ppm	0.2
Blank-Sulfate	7/18/2015	u	ppm	0.2
Blank-Bromide	7/18/2015	u	ppm	0.2
Blank-Nitrate	7/18/2015	u	ppm	0.2
Blank-Chlroate	7/18/2015	u	ppm	0.2
Blank-Phosphate	7/18/2015	u	ppm	0.2

u: Compound not detected above Practical Quantitation Limit (PQL).

Calibration Verification Summary: Anions

Check Standard recoveries:

Sample:	Date	Std ppm	Obs ppm	% recovery
Fluoride check	8/27/2015	5.00	4.91	98.1
			Control Limits:	78.09-136.27%
Chloride check	8/27/2015	5.00	4.41	88.2
			Control Limits:	69.83-129.16%
Nitrite check	8/27/2015	5.00	5.40	108.0
			Control Limits:	78.97-129.16%
Sulfate check	8/27/2015	5.00	4.29	85.7
			Control Limits:	68.83-128.49%
Bromide check	8/27/2015	5.00	4.22	84.3
			Control Limits:	67.19-129%
Nitrate check	8/27/2015	5.00	4.41	88.3
			Control Limits:	73.49-129.35%
Chlorate check	8/27/2015	5.00	4.24	84.8
			Control Limits:	67.11-135.2%
Phosphate check	8/27/2015	5.00	4.50	90.0
			Control Limits:	64.49-128.89%

QC Check:

Sample:	Date	Std ppm	Obs ppm	% recovery
QC Check-Fluoride	8/27/2015	10.0	10.38	103.8
QC Check-Chloride	8/27/2015	10.0	10.57	105.7
QC Check-Nitrite	8/27/2015	10.0	11.02	110.2
QC Check-Sulfate	8/27/2015	10.0	10.04	100.4
QC Check-Bromide	8/27/2015	10.0	9.45	94.5
QC Check-Nitrate	8/27/2015	10.0	9.93	99.3
QC Check-Phosphate	8/27/2015	10.0	8.88	88.8

Control Limits: 80.0-120.0%

Method Blank Summary: Anions

Sample	Date	Concentration	Units	PQL
Blank-Fluoride	8/27/2015	u	ppm	0.2
Blank-Chloride	8/27/2015	u	ppm	0.2
Blank-Nitrite	8/27/2015	u	ppm	0.2
Blank-Sulfate	8/27/2015	u	ppm	0.2
Blank-Bromide	8/27/2015	u	ppm	0.2
Blank-Nitrate	8/27/2015	u	ppm	0.2
Blank-Chlroate	8/27/2015	u	ppm	0.2
Blank-Phosphate	8/27/2015	u	ppm	0.2

u: Compound not detected above Practical Quantitation Limit (PQL).

Calibration Verification Summary: Anions

Check Standard recoveries:

Sample:	Date	Std ppm	Obs ppm	% recovery
Fluoride check	9/3/2015	5.00	4.88	97.6
			Control Limits:	78.09-136.27%
Chloride check	9/3/2015	5.00	4.59	91.8
			Control Limits:	69.83-129.16%
Nitrite check	9/3/2015	5.00	5.17	103.4
			Control Limits:	78.97-129.16%
Sulfate check	9/3/2015	5.00	4.75	95.0
			Control Limits:	68.83-128.49%
Bromide check	9/3/2015	5.00	4.51	90.2
			Control Limits:	67.19-129%
Nitrate check	9/3/2015	5.00	4.56	91.2
			Control Limits:	73.49-129.35%
Chlorate check	9/3/2015	5.00	4.39	87.8
			Control Limits:	67.11-135.2%
Phosphate check	9/3/2015	5.00	4.38	87.6
			Control Limits:	64.49-128.89%

QC Check:

Sample:	Date	Std ppm	Obs ppm	% recovery
QC Check-Fluoride	9/3/2015	100.0	108.30	108.3
QC Check-Chloride	9/3/2015	200.0	184.70	92.4
QC Check-Nitrite	9/3/2015	200.0	201.50	100.8
QC Check-Sulfate	9/3/2015	300.0	284.00	94.7
QC Check-Bromide	9/3/2015	200.0	180.60	90.3
QC Check-Nitrate	9/3/2015	200.0	189.60	94.8
QC Check-Phosphate	9/3/2015	300.0	266.80	88.9
		Control Limits:	80.0-120.0%	

Method Blank Summary: Anions

Sample	Date	Concentration	Units	PQL
Blank-Fluoride	9/3/2015	u	ppm	0.2
Blank-Chloride	9/3/2015	u	ppm	0.2
Blank-Nitrite	9/3/2015	u	ppm	0.2
Blank-Sulfate	9/3/2015	u	ppm	0.2
Blank-Bromide	9/3/2015	u	ppm	0.2
Blank-Nitrate	9/3/2015	u	ppm	0.2
Blank-Chlroate	9/3/2015	u	ppm	0.2
Blank-Phosphate	9/3/2015	u	ppm	0.2

u: Compound not detected above Practical Quantitation Limit (PQL).

/14/15 Perchlorate samples [redacted] groundwater
Field column resin extraction & $KClO_4$ purification by Neil Stuchio

CALIBRATION	
PPM	PK AREA
10	0.162
100	1.641
1000	17.58

	EIGL J-#	SAMPLE ID	PK AREA	UG/ML	MG TOTAL	MG/ML*	2.5 mL Redissolved mg/mL	
	J-1703	1703	1.113	67.824	0.610	0.068	0.244	2.01
	J-1704	1704	0.193	11.761	0.106	0.012	0.042	(11.9)
should be J-1699 ←	J-1690	453	1.212	73.857	0.665	0.074	0.266	1.88
	J-1694	457	1.429	87.081	0.784	0.087	0.314	1.59
	J-1696	460	1.722	104.936	0.944	0.105	0.378	1.32
SPE not used ←	J-1698 brown xtals	461	4.003	243.937	2.195	0.244	0.878	0.57

*each 15-mL centrifuge tube contains 9 mL of purified solution

mL for 0.5 mg

Starting volume 10 mL

1 mL removed for IC, diluted ? → to 5 mL

Soln' left after IC 2.5 mL added back to → Remaining soln' evaporated to dry → dry crystals to dissolve

Aliquot of new solution removed to take 0.5 mg for combustion

	g soln
brownish xtals → J-1703 G-2937	2.033 g
J-~~1690~~ 1699 G-2478	1.899 g
J-1694 G-2473	1.607 g
J-1696 G-2475	1.348 g
J-1698	0.602 g

} in 90°C oven to evap.

→ pg 77

Standards for samples @ 0.5mg 10/16/15

125-1016A	0.540g	1.002mg/mm	In 90°C oven to evap
1016B	0.528g		
132-1016A	0.515	1.006mg/mm	
1016B	0.539		

10/19/15

Pre bake stds + samples (previous pg 76) @ 400°C 10min

All samples discolored after cooking (J-1703 was brownish before cooking)

Looks like TPA not all gone? Try rinsing w/ H_2O cont pg 78

Wash AgCl pot

pg 66

				10	5	0H	xfer w/ glass filter swab
J-6 1001B				✓	✓	✓	✓
J-1709 (2486)				✓	✓	✓	✓
J-6 1001 A	✓	✓	✓	✓	✓	✓	✓
J-1710 ? (2487)	✓	✓	✓	✓	✓	✓	✓
J-1707 B (2484) PB	✓	✓	✓	✓	✓	✓	✓
J-1708 B (2485)	✓	✓	✓	✓	✓	✓	✓
J-1710 A (2487)	✓	✓	✓	✓	✓	✓	✓
J-125 0824A	✓	✓	✓	✓	✓	✓	✓
J-6 1001 C	✓	✓	✓	✓	✓	✓	✓
J-1708A (2485) empty?	✓	✓	✓	✓	✓	✓	✓
J-125 0824 D	✓	✓	✓	✓	✓	✓	✓
J-1710 B (2484) PB	✓	✓	✓	✓	✓	✓	✓

pg 78 JH

Clean up

Test w/ J-1698 (467) w/ "lots" remaining - does brown stuff dissolve?

Add 1 mL D_1H_2O

yes brown xtals dissolve w/in

Re-evaporate to dry

10/23/15 brown xtals still there - around & on clean xtals

Add 1 mL acetone does clean material dissolve?

looks like it, while brown stuff not

leave sit ~ 2 hrs

J-1698 (461) test

	empty tube wt	dry full tube
	~~13.11205~~	
	11.35164 g	11.35287
	11.35151	11.35290
	11.35161	11.35268

Xfer soln to new pre-weighed combustion tube using long disp pipette

rinse 3x w/ 0.5 mL acetone

evap 11.35159 — 11.35282

combust this aliquot & look at O_2 ⇒ 12/7/15 No O_2 after combust All CO_2 (7V) + N_2 (8

Confirm pretreatments on remaining sample

0.5 mg → evap → pre bake 400°C → dissolve SPE → into 9mm tube → evap → seal/combust

J-1698 (467) X

11/11/15 0.56 g soln into sm 10 mL beaker

0.5 mg → evap → ethanol rinse → dissolve into 9mm tube → evap → pre bake 400°C → seal/combust

J-1698 (461) N

11/11/15 0.59 g soln into sm beaker

J-1698 (461) Z

12/12/15 ~0.6 mL brought through entire ABC procedure, evap'd, redissolve & pas

pg 81 JA

132·0917 B	132·0917 F	125 0917 A	7ex132
132·0917 E	132·0917 D	132·0917 C	6x125
132 0824 A U	921·0917 D	921·0917 E	6x125
125·0917 C	125·0917 B	921·0917 B	1x7
125·0917 F	125·0917 E U	921·0917 F	
J7-7-22 pml	125·0917 D	921·0917 C	

921·0917 A
132-0917 A

In program oven for 2 hrs @ 300°C
long cool @ 50°

1.6

from pg 78 Transfer [redacted] $KClO_4$ into combustion tubes
after re-processing aka NES (SPE cleanup +/or EtOH rinse)

4 x 0.5mL warm Di H_2O

G-2477	1698 X (SPE) →	brown
"	1698 Z (raw) - not prebaked raw 2nd EtOH → SPE #461 →	brown
G-2475	1696 (460 - SPE) →	brown
G-2473	1694 (457 - SPE)	very s hint c brow
-2478 = J·1699 = #453	1690 (453 - SPE)	
-2937	1703 a (SPE) →	some
"	1703 b (full Abe) - not prebaked, full Abe method → SPE →	tiny b

↑
left o
after
rins

Rinse AgCl ppts 1/21/16

	Supnt	15	10	5	5	Mott Xfer
J-1771	✓	✓	✓	✓	✓	✓
J-1750A	✓	✓	✓	✓	✓	✓
J-1768	✓	✓	✓	✓	✓	✓
J-1752A	✓	✓	✓	✓	✓	✓
J-1755	✓	✓	✓	✓	✓	✓
J-1757	✓	✓	✓	✓	✓	✓
J-1770	✓	✓	✓	✓	✓	✓
J-1747A	✓	✓	✓	✓	✓	✓

	Supnt	15	10	5	5	Mott Xfer
J-1777	✓	✓	✓	✓	✓	✓
J-1775	✓	✓	✓	✓	✓	✓
J-132 C	✓	✓	✓	✓	✓	✓
J-132 D	✓	✓	✓	✓	✓	✓
J-1772	✓	✓	✓	✓	✓	✓
J-1748						
J-125 C						
J-125 E						

Seal tubes for ClO_4 combustn 1/22/16

samples repressed by NCS, evapd, pre combusted 10 min @ 400°C
All brown + black !!! contamination from PH007 fume hoods?
→ prep standards evapd in PH007 →

1699 Z (raw)
1698 N (0.4mg)
1703b (full Abe)
1698 X (SPE)
1690 (453 > SPE)
1696 (460 > SPE)

1703a (SPE)
1697 (457 > SPE)
125-0016A
125-1016 B
132-1016 A
132-1016 B
} 0.5mg pg 77

Rinse AgCl ppts

3/3/16

	5min	15	10	5	5 Mell	1hr
132-1016 A	✓	✓	✓	✓	✓	✓
125-1016 B	✓	✓	✓	✓	✓	✓
1698 - N 0.4mg	✓	✓	✓	✓	✓	✓
1690 - 453 SPE	✓	✓	✓	✓	✓	✓

	5min	15	10	5	5 Mell	1hr
125-0016 A	✓	✓	✓	✓	✓	✓
1698 - X SPE	✓	✓	✓	✓	✓	✓
J-7 5µml	✓	✓	✓	✓	✓	✓
J-6 5µml	✓	✓	✓	✓	✓	✓

3/4/16

1696-460-SPE	✓	✓	✓	✓	✓	✓
1698 Z raw	✓	✓	✓	✓	✓	✓
1703 ~~1073~~ b full tube	✓	✓	✓	✓	✓	✓
FH-1	✓	✓	✓	✓	✓	✓

132-1016 B	✓	✓	✓	✓	✓	✓
1703 a SPE	✓	✓	✓	✓	✓	✓
1694-457 SPE	✓	✓	✓	✓	✓	✓
1698 acetone test	✓	✓	✓	✓	✓	✓

3/7/16

~~125-0114 B~~	✓	✓	✓	✓	✓	✓
~~1751-0114 B~~	✓	✓	✓	✓	✓	✓
~~132-0114 B~~	✓	✓	✓	✓	✓	✓
~~1749-0106 B~~	✓	✓	✓	✓	✓	✓

~~1748-0106 B~~	✓	✓	✓	✓	✓	✓
~~1752-0114 B~~	✓	✓	✓	✓	✓	✓
~~1750-0114 B~~	✓	✓	✓	✓	✓	✓
~~1747-0106 B~~	✓	✓	✓	✓	✓	✓

125-0104 F	✓	✓	✓	✓	✓	✓
125-0D A	✓	✓	✓	✓	✓	✓
132-0D B	✓	✓	✓	✓	✓	✓
UIC-7	✓	✓	✓	✓	✓	✓

132-0114 F	✓	✓	✓	✓	✓	✓
132-0D A	✓	✓	✓	✓	✓	✓
125-0114 G	✓	✓	✓	✓	✓	✓
125-0D B	✓	✓	✓	✓	✓	✓

Load CH_2I

3/14/16

125-1016 A
1696-460-SPE
1698 Z raw
1703 b full tube
1690-453 SPE
1698 N 0.4mg

1698 X SPE
125-1016 B
132-1016 B
132-1016 A
J6-5µml
1698 acetone test

1694-457 SPE
J-7 5µml
1703 a SPE
FH-1

scratch label
in pyrex oven 2hrs @ 300°C

CH_3Cl EnSafe/ ~~[illegible]~~ 3/15/16

Sound R-11

7.1	R-11 zero	1.3	1.3	-0.011	0.004	25818
		"	"	-0.029	0.007	19
		"	"	-0.030	0.007	25820
		"	"	-0.035	0.006	21
	"	1.4	1.5	-0.036	0.005	22
		"	1.4	-0.039	0.010	23

Tune adjust

6.5	10	10
4.9	664	7.0
7.5	981	4.5

		1.5	1.5	-0.041	0.009	24
				-0.041	0.011	25
		1.4	1.5	-0.040	0.008	26
				-0.039		27
2.3	J-125-1016B	2.4	2.4	-5.763	0.007	28
		2.2	2.2	-5.780	0.005	29
2.0	J-132-1016B	1.9	1.8	-90.882	0.004	25830
		1.8	"	-90.756	0.170	31
	"	1.6	1.6	-90.061	0.007	32
				-90.098	0.007	33
	"	1.4	1.4	-90.088	0.012	34
		"	"	-90.136	0.016	35
3.2	J-1703 b full Alce Colton 17 F #449	2.7	2.7	-11.328 ~~0.011~~	0.011	36 ✓
				-11.374	0.008	37 ✓
		3.3	3.3	-11.433	0.008	38 ✓
		3.2	3.2	-11.451	0.005	39 ✓
2.1	J-1703 a SPE	2.1	2.1	-11.307	0.004	25840 ✓
		2.0	2.0	-11.204	0.134	41 ✓

12/9/14 100°C w/LN2

O2

66✓	4.2	1698 X SPE	7.8	7.8	-15.965	0.040	-33.672	0.031
67✓	~~1609~~		7.7	7.9	-15.980	0.060	-33.688	0.025
	2.4	Lefloxus @50%	32	-609 mV				
			44	-1077 mV				
68	5.1	125-1016A	7.8	7.9	-19.496	0.017	-37.263	0.018
69			"	"	-19.478	0.064	-37.282	0.014
25670	4.8	132-1016A	7.8	7.9	71.408	0.029	18.119	0.011
71			"	"	71.454	0.056	18.011	0.011
72		"	7.8	7.9	71.399	0.039	18.131	0.025
73			"	7.8	71.398	0.029	18.163	0.013

L 25673-25662 reeval.xls

2/1/16

74		"	7.8	7.9	71.401	0.024	18.199	0.007
75			"	7.8	71.528	0.057	18.203	0.027
76		"	7.8	7.9	71.458	0.037	18.258	0.024
77			"	7.8	7.1409	0.030	18.236	0.019
78	4.9	125-1016B	7.8	7.9	-19.470	0.042	-37.170	0.019
79			"	7.8	-19.434	0.027	-37.172	0.021
25680	5.1	132-1016B	7.7	7.9	72.476	0.043	18.969	0.014
81			7.8	"	72.563	0.046	18.969	0.021
82✓	6.7	1703b (full tube)	7.9	7.9	-14.721	0.056	-34.699	0.021
83✓		G-2937	"	7.8	-14.716	0.036	-34.694	0.019
	3.4	lefloxus @50% →	32 →	~~1987~~ 1387 mV				
			44 →	1501 mV				
84✓	3.0	1703a (SPE)	7.7	7.8	-12.883	0.037	-31.341	0.024
85✓		G-2937	7.2	7.3	-12.912	0.032	-31.300	0.015
	3.0	lefloxus @50% →	32 →	397 mV				
			44 →	1920 mV				
86✓	4.0		7.7	7.8	-12.063	0.040	-26.588	0.017
87✓			7.8	7.9	-12.060	0.018	-26.568	
	3.3	lefloxus ~50%	32 →	574 mV				
			44 →	1727 mV				

L-25674-25687 reeval.xls

Submission: 4/10/2015 Ensafe, Josh Teves G-2937 to G-2938

3/24/2016

Medium: 80 --> G [O2] gaseous oxygen (analyzed as O2 for O-17 & O-18)

Purpose: Perchlorate for 17O and 18O

Location:

Sample ID:	Collection Date	Our Lab ID	$1000\,\delta^{17}O_{VSMOW}$ Value	Comment	$1000\,\delta^{18}O_{VSMOW}$ Value	Comment
Colton17F (J-1703)		**G-2937**	**-1.95**		**-11.75**	
5W13B5F280 (J-1704)		**G-2938**				

Dual Inlet MeasurementResults EIGL Delta Plus XL

Line				Identifier 1	Identifier 2	Analysis	Comment	Method
2	X	X	X	GG	1703a	L-25685	SPE	O2 dual inlet.met

	Int.32 Sample [mV]	Int.33 Sample [mV]	Int.34 Sample [mV]	Int.32 Standard [mV]	Int.33 Standard [mV]	Int.34 Standard [mV]	d 33O2/32	d 34O2/32	d 17O/16O	d 18O/16O
Pre				7309.175	555.574	3040.025				
1	7250.231	544.068	2921.094	7298.141	554.941	3035.679	-12.932	-31.349	-12.932	-31.349
2	7216.784	541.624	2907.835	7292.309	554.490	3033.240	-12.987	-31.313	-12.987	-31.313
3	7174.563	538.458	2890.966	7273.448	553.102	3025.702	-13.016	-31.312	-13.016	-31.312
4	7156.072	537.053	2883.498	7282.411	553.684	3029.039	-13.001	-31.305	-13.001	-31.305
5	7117.437	534.195	2867.893	7278.787	553.450	3027.486	-12.873	-31.247	-12.873	-31.248
6	7088.170	532.032	2856.154	7253.059	551.538	3016.982	-12.887	-31.253	-12.887	-31.253
7	7041.890	528.557	2837.561	7245.990	551.033	3014.138	-12.958	-31.282	-12.958	-31.282
8	7016.563	526.704	2827.442	7232.088	549.946	3008.426	-12.871	-31.279	-12.871	-31.279
9	6973.818	523.475	2810.154	7225.813	549.486	3005.785	-12.899	-31.307	-12.899	-31.307
10	6948.414	521.535	2799.764	7214.713	548.540	3001.192	-12.884	-31.359	-12.884	-31.359

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 33O2/32O2 [per mil] vs. VSMOW	-12.912	0.032	0.014		5
d 34O2/32O2 [per mil] vs. VSMOW	-31.300	0.015	0.006		4
d 17O/16O [per mil] vs. VSMOW	-12.912	0.032	0.014	0.037485	5
d 18O/16O [per mil] vs. VSMOW	-31.300	0.015	0.006	0.193867	4

Gas Configuration		Calibration	
Gas	O2	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	8763	16.0	5543
Cups	3,4,5	28.0	7897
Masses	32.0,33.0,34.0	32.0	8594

Infomation	Dual Inlet System			
Peak Center found at [2075]	Cycles	10	Idle time [s]	15.0
Background: 117.15 mV,107.68 mV,111.92 mV	PressAdjust Level [mV]	at Cup 0 (+/- 0.00)	Pressadjust Delay [s]	10.0
Pressure Adjustment: Left: 7454.0 Right: 7458.7 (Manual Adjustment)	FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Ref. Name: d 17O/16O vs. d 18O/16O vs.	HV Pump Time [s]	60.0		

Dual Inlet MeasurementResults EIGL Delta Plus XL

[illegible] February 01, 2010 15:59:0[illegible]

[illegible] \Dual Inlet System\Results\160201 JAN 010 small O2IL 25684 GG 1703a.caf

Line				Identifier 1	Identifier 2	Analysis	Comment	Method
1	X	X	X	GG	1703a	L-25684	SPE	O2 dual inlet.met

	Int.32 Sample [mV]	Int.33 Sample [mV]	Int.34 Sample [mV]	Int.32 Standard [mV]	Int.33 Standard [mV]	Int.34 Standard [mV]	d 33O2/32	d 34O2/32	d 17O/16O	d 18O/16O
Pre				7823.277	594.745	3253.288				
1	7758.573	582.163	3125.207	7820.192	594.389	3252.059	-12.890	-31.366	-12.890	-31.366
2	7711.651	578.606	3106.367	7809.650	593.648	3247.785	-12.902	-31.372	-12.902	-31.372
3	7667.827	575.365	3089.084	7782.385	591.572	3236.470	-12.869	-31.276	-12.869	-31.276
4	7620.843	571.766	3070.394	7777.615	591.318	3234.777	-13.084	-31.248	-13.084	-31.248
5	7590.397	569.653	3058.066	7774.425	591.045	3233.350	-12.852	-31.296	-12.852	-31.296
6	7551.132	566.680	3042.225	7750.630	589.194	3223.745	-12.837	-31.331	-12.837	-31.331
7	7512.577	563.858	3026.863	7736.100	588.180	3217.777	-12.753	-31.332	-12.753	-31.332
8	7477.110	561.145	3012.604	7722.846	587.165	3212.397	-12.911	-31.353	-12.911	-31.354
9	7442.075	558.532	2998.586	7718.245	586.842	3210.531	-12.899	-31.349	-12.899	-31.349
10	7407.189	555.921	2984.433	7709.863	586.197	3206.839	-12.903	-31.356	-12.903	-31.357

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 33O2/32O2 [per mil] vs. VSMOW	-12.883	0.027	0.010		2
d 34O2/32O2 [per mil] vs. VSMOW	-31.341	0.024	0.009		3
d 17O/16O [per mil] vs. VSMOW	-12.883	0.027	0.010	0.037487	2
d 18O/16O [per mil] vs. VSMOW	-31.341	0.024	0.009	0.193859	3

Gas Configuration		Calibration	
Gas	O2	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	8763	16.0	5543
Cups	3,4,5	28.0	7897
Masses	32.0,33.0,34.0	32.0	8594

Infomation	Dual Inlet System			
Peak Center found at [2075]	Cycles	10	Idle time [s]	15.0
Background: 113.54 mV,107.38 mV,110.34 mV	PressAdjust Level [mV]	at Cup 0 (+/- 0.00)	Pressadjust Delay [s]	10.0
Pressure Adjustment: Left: 8007.5 Right: 7989.6 (Manual Adjustment)	FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Ref. Name: d 17O/16O vs. d 18O/16O vs.	HV Pump Time [s]	60.0		

Dual Inlet MeasurementResults EIGL Delta Plus XL

Monday, February 01, 2016 15:00:45

[illegible]

Line				Identifier 1	Identifier 2	Analysis	Comment	Method
2	X	X	X	GG	1703b	L-25683	full Abe	O2 dual inlet.met

	Int.32 Sample [mV]	Int.33 Sample [mV]	Int.34 Sample [mV]	Int.32 Standard [mV]	Int.33 Standard [mV]	Int.34 Standard [mV]	d 33O2/32	d 34O2/32	d 17O/16O	d 18O/16O
Pre				7890.619	599.494	3280.651				
1	7908.401	592.126	3174.351	7884.562	599.141	3278.731	-14.600	-34.666	-14.600	-34.666
2	7883.261	590.312	3164.616	7874.806	598.592	3274.769	-14.731	-34.659	-14.731	-34.660
3	7861.541	588.695	3155.938	7857.784	597.287	3267.870	-14.866	-34.687	-14.866	-34.687
4	7849.356	587.827	3151.029	7844.952	596.265	3262.568	-14.742	-34.724	-14.742	-34.724
5	7833.890	586.695	3145.125	7837.842	595.758	3259.726	-14.687	-34.653	-14.687	-34.653
6	7818.642	585.551	3138.872	7822.146	594.558	3253.143	-14.714	-34.702	-14.714	-34.702
7	7811.750	585.053	3136.040	7815.064	593.994	3250.345	-14.655	-34.736	-14.655	-34.736
8	7799.134	584.065	3130.926	7808.212	593.482	3247.430	-14.714	-34.763	-14.714	-34.764
9	7769.634	581.873	3119.343	7779.839	591.414	3235.792	-14.766	-34.697	-14.766	-34.698
10	7757.252	580.929	3114.342	7781.700	591.502	3236.269	-14.824	-34.686	-14.824	-34.687

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 33O2/32O2 [per mil] vs. VSMOW	-14.716	0.036	0.014		3
d 34O2/32O2 [per mil] vs. VSMOW	-34.694	0.019	0.008		4
d 17O/16O [per mil] vs. VSMOW	-14.716	0.036	0.014	0.037417	3
d 18O/16O [per mil] vs. VSMOW	-34.694	0.019	0.008	0.193189	4

Gas Configuration		Calibration	
Gas	O2	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	8763	16.0	5543
Cups	3,4,5	28.0	7897
Masses	32.0,33.0,34.0	32.0	8594

Infomation	Dual Inlet System			
Peak Center found at [2081]	Cycles	10	Idle time [s]	15.0
Background: 116.23 mV,107.56 mV,111.53 mV	PressAdjust Level [mV]	at Cup 0 (+/- 0.00)	Pressadjust Delay [s]	10.0
Pressure Adjustment: Left: 8010.2 Right: 7978.1 (Manual Adjustment)	FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Ref. Name: d 17O/16O vs. d 18O/16O vs.	HV Pump Time [s]	60.0		

Dual Inlet MeasurementResults EIGL Delta Plus XL

[illegible] JAN 0104 small OPI -25682 O2_1703b.caf

Line				Identifier 1	Identifier 2	Analysis	Comment	Method
1	X	X	X	GG	1703b	L-25682	full Abe	O2 dual inlet.met

	Int.32 Sample [mV]	Int.33 Sample [mV]	Int.34 Sample [mV]	Int.32 Standard [mV]	Int.33 Standard [mV]	Int.34 Standard [mV]	d 33O2/32	d 34O2/32	d 17O/16O	d 18O/16O
Pre				7956.561	604.593	3308.011				
1	7908.818	592.078	3174.028	7937.561	603.224	3300.223	-14.849	-34.727	-14.849	-34.727
2	7898.925	591.531	3170.284	7917.184	601.729	3292.128	-14.632	-34.729	-14.632	-34.730
3	7876.207	589.805	3161.439	7913.464	601.490	3290.525	-14.753	-34.693	-14.753	-34.693
4	7858.717	588.452	3154.271	7896.554	600.131	3283.424	-14.800	-34.720	-14.800	-34.720
5	7837.641	586.930	3146.163	7884.139	599.206	3278.544	-14.660	-34.643	-14.660	-34.644
6	7836.442	586.854	3145.745	7883.376	599.140	3278.215	-14.646	-34.664	-14.646	-34.664
7	7818.397	585.477	3138.563	7873.158	598.434	3274.042	-14.741	-34.654	-14.741	-34.655
8	7809.882	584.799	3135.124	7861.232	597.464	3269.198	-14.813	-34.689	-14.813	-34.689
9	7792.886	583.561	3128.243	7849.260	596.566	3264.195	-14.713	-34.720	-14.713	-34.720
10	7778.359	582.539	3122.590	7833.158	595.397	3257.785	-14.657	-34.704	-14.657	-34.704

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 33O2/32O2 [per mil] vs. VSMOW	-14.721	0.056	0.023		4
d 34O2/32O2 [per mil] vs. VSMOW	-34.698	0.021	0.009		4
d 17O/16O [per mil] vs. VSMOW	-14.721	0.056	0.023	0.037417	4
d 18O/16O [per mil] vs. VSMOW	-34.699	0.021	0.009	0.193188	4

Gas Configuration		Calibration	
Gas	O2	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	8763	16.0	5543
Cups	3,4,5	28.0	7897
Masses	32.0,33.0,34.0	32.0	8594

Infomation	Dual Inlet System			
Peak Center found at [2081]	Cycles	10	Idle time [s]	15.0
Background: 112.56 mV,107.30 mV,109.94 mV	PressAdjust Level [mV]	at Cup 0 (+/- 0.00)	Pressadjust Delay [s]	10.0
Pressure Adjustment: Left: 7991.2 Right: 8023.9 (Manual Adjustment)	FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Ref. Name: d 17O/16O vs. d 18O/16O vs.	HV Pump Time [s]	60.0		

User Defined 0.000 VSMOW 0.000 VSMOW

Submission: 4/10/2015 Ensafe, Josh Teves J-1703 to J-1704

3/24/2016

Medium: 135 --> J [ClO4] perchlorates

Purpose: Groundwater perchorate for 37Cl

Location:

Sample ID:	Collection Date	Our Lab ID	$1000\,\delta^{18}O_{VSMOW}$ Value	Comment	$1000\,\delta^{37}Cl_{SMOC}$ Value	Comment
Colton17F #449		**J-1703**			**-4.66**	
5W13B5F280 #447		**J-1704**				

Dual Inlet Measurement Results FIGI Delta Plus XL

Tuesday, March 15, 2016 17:22:37

[illegible]

Line			F	E	Identifier 1	Identifier 2	Analysis	Comment	Method
2	X	X	X		J-1703	Colton17F 449	L-25841	a SPE	CH3Cl dual inlet.

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			2096.152	2290.019				
1	2066.740	2232.019	2091.417	2284.344	0.3159998	-11.348	-11.348	24.012148
2	2057.214	2221.432	2086.833	2279.170	0.3160036	-11.336	-11.336	24.012363
3	2047.698	2211.078	2083.165	2275.059	0.3160114	-11.312	-11.312	24.012814
4	2036.894	2199.397	2079.004	2270.526	0.3160157	-11.299	-11.299	24.013062
5	2023.703	2185.291	2074.635	2265.818	0.3160303	-11.253	-11.253	24.013910
6	2009.457	2170.202	2070.425	2261.408	0.3160556	-11.174	-11.174	24.015371
7	1994.967	2154.964	2066.304	2257.101	0.3160894	-11.068	-11.068	24.017318
8	1982.248	2141.529	2062.395	2252.898	0.3161159	-10.985	-10.985	24.018851
9	1970.589	2129.203	2058.737	2249.043	0.3161413	-10.905	-10.905	24.020319
10	1960.269	2118.188	2054.476	2244.392	0.3161513	-10.874	-10.874	24.020893

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.204	0.134	0.051		3
d 37Cl/35Cl [per mil] vs. SMOC	-11.204	0.134	0.051	24.014813	3

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1934]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 106.89 mV,107.33 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 2190.0 Adjust: 2205.7 Sample is Master						

Dual Inlet Measurement Results FIGL Delta Plus XL

Tuesday, March 15, 2016 17:11:43

[illegible]

Line		F	E	Identifier 1	Identifier 2	Analysis	Comment	Method
1	X	X	X	J-1703	Colton17F 449	L-25840	a SPE	CH3Cl dual inlet.

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			2154.027	2353.378				
1	2190.851	2366.567	2146.206	2344.826	0.3160164	-11.296	-11.296	24.013106
2	2179.264	2354.052	2141.023	2339.169	0.3160166	-11.296	-11.296	24.013116
3	2168.356	2342.272	2135.824	2333.495	0.3160161	-11.297	-11.297	24.013087
4	2158.060	2331.148	2131.281	2328.534	0.3160153	-11.300	-11.300	24.013044
5	2147.988	2320.251	2126.777	2323.617	0.3160126	-11.308	-11.308	24.012884
6	2138.151	2309.614	2122.078	2318.461	0.3160123	-11.309	-11.309	24.012867
7	2128.544	2299.218	2117.969	2313.991	0.3160099	-11.317	-11.317	24.012731
8	2118.802	2288.703	2113.913	2309.573	0.3160088	-11.320	-11.320	24.012665
9	2109.381	2278.565	2109.684	2304.959	0.3160127	-11.308	-11.308	24.012892
10	2100.160	2268.585	2105.886	2300.776	0.3160120	-11.310	-11.310	24.012850

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.307	0.004	0.002		5
d 37Cl/35Cl [per mil] vs. SMOC	-11.307	0.004	0.002	24.012907	5

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1941]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 106.84 mV,107.27 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 2337.4 Adjust: 2310.9 Sample is Master						

Dual Inlet Measurement Results FIGL Delta Plus XL

Tuesday, March 15, 2016 16:53:25

[illegible]

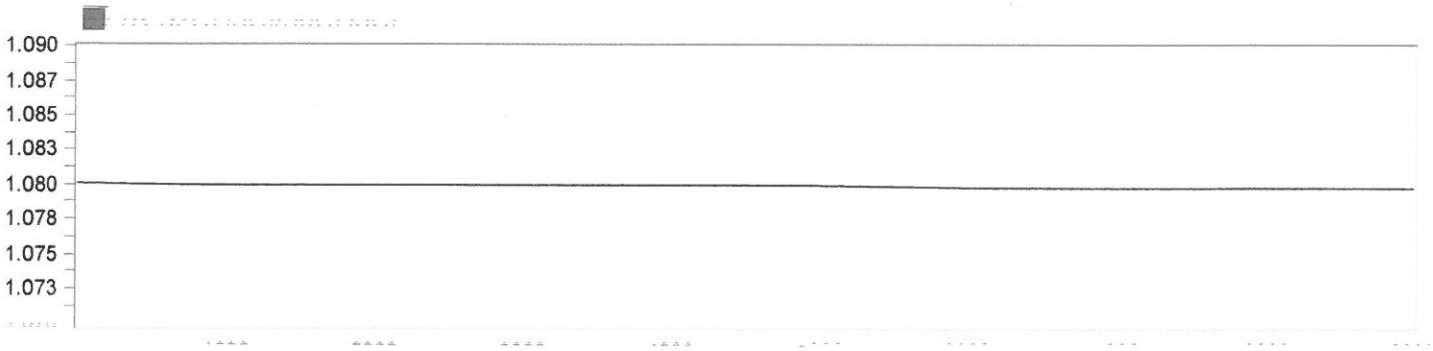
Line				Identifier 1	Identifier 2	Analysis	Comment	Method
2	X	X	X	J-1703	Colton17F 449	L-25839	b full Abe	CH3Cl dual inlet.

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			3241.122	3541.497				
1	3226.688	3485.092	3231.627	3530.565	0.3159684	-11.447	-11.447	24.010332
2	3214.890	3472.074	3221.441	3519.455	0.3159674	-11.450	-11.450	24.010274
3	3202.939	3459.121	3212.148	3509.175	0.3159681	-11.448	-11.448	24.010314
4	3191.450	3446.605	3202.382	3498.445	0.3159666	-11.452	-11.452	24.010228
5	3179.924	3434.091	3193.008	3488.156	0.3159654	-11.456	-11.456	24.010162
6	3169.099	3422.339	3184.100	3478.329	0.3159662	-11.453	-11.453	24.010207
7	3157.446	3409.668	3174.514	3467.856	0.3159626	-11.465	-11.465	24.009999
8	3145.841	3397.160	3165.531	3457.970	0.3159683	-11.447	-11.447	24.010325
9	3135.216	3385.549	3156.185	3447.725	0.3159603	-11.472	-11.472	24.009867
10	3123.889	3373.329	3147.042	3437.715	0.3159641	-11.460	-11.460	24.010088

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.451	0.005	0.002		2
d 37Cl/35Cl [per mil] vs. SMOC	-11.451	0.005	0.002	24.010241	2

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1934]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 106.98 mV,107.45 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 3353.6 Adjust: 3353.1 Sample is Master						



Dual Inlet Measurement Results EIGL Delta Plus XL

Tuesday, March 15, 2016 16:42:31

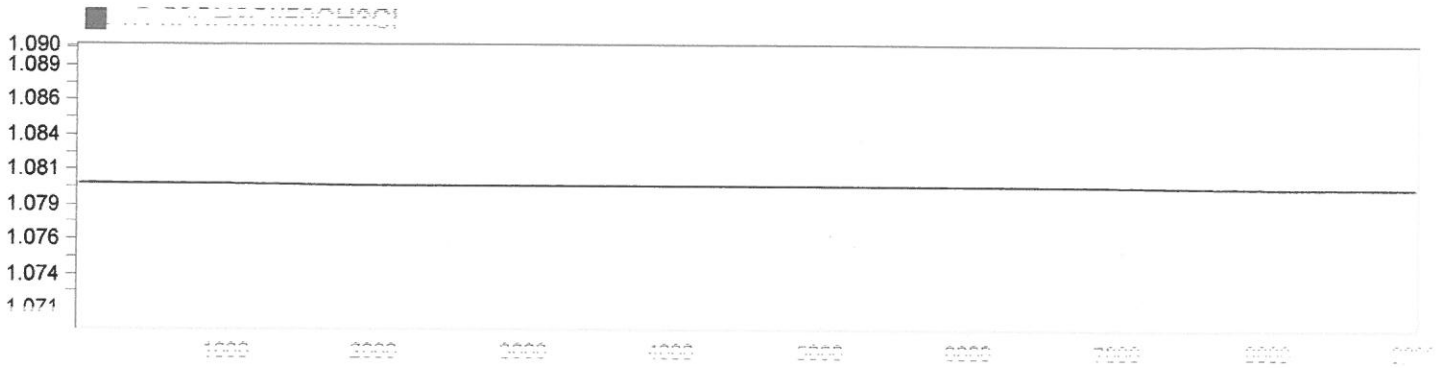
Line				Identifier 1	Identifier 2	Analysis	Comment	Method
1	X	X	X	J-1703	Colton17F 449	L-25838	b full Abe	CH3Cl dual inlet

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			3362.745	3674.608				
1	3375.906	3646.777	3352.283	3663.076	0.3159738	-11.430	-11.430	24.010644
2	3363.256	3633.051	3341.925	3651.682	0.3159762	-11.422	-11.422	24.010782
3	3351.180	3619.958	3332.232	3641.011	0.3159786	-11.414	-11.414	24.010925
4	3338.906	3606.609	3322.181	3629.999	0.3159754	-11.425	-11.425	24.010739
5	3326.883	3593.595	3312.539	3619.385	0.3159778	-11.417	-11.417	24.010875
6	3315.105	3580.698	3303.053	3608.914	0.3159705	-11.440	-11.440	24.010455
7	3302.753	3567.301	3293.275	3598.166	0.3159730	-11.432	-11.432	24.010602
8	3291.443	3554.988	3284.048	3588.025	0.3159699	-11.442	-11.442	24.010417
9	3279.998	3542.584	3274.375	3577.413	0.3159707	-11.439	-11.439	24.010467
10	3268.543	3530.134	3264.951	3567.072	0.3159676	-11.449	-11.449	24.010285

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.433	0.008	0.003		3
d 37Cl/35Cl [per mil] vs. SMOC	-11.433	0.008	0.003	24.010587	3

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1934]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 107.01 mV,107.48 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 3520.9 Adjust: 3497.7 Sample is Master						



Dual Inlet Measurement Results EIGL Delta Plus XL

Tuesday, March 15, 2016 16:28:45

Line			F	E	Identifier 1	Identifier 2	Analysis	Comment	Method
2	X	X	X		J-1703	Colton17F 449	L-25837	b full Abe	CH3Cl dual inlet.

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			2682.880	2932.305				
1	2657.519	2871.323	2676.665	2925.166	0.3159853	-11.394	-11.394	24.011309
2	2650.634	2863.684	2670.499	2918.329	0.3159872	-11.387	-11.387	24.011422
3	2643.611	2856.067	2664.886	2912.101	0.3159944	-11.365	-11.365	24.011834
4	2636.937	2848.766	2659.156	2905.770	0.3159933	-11.368	-11.368	24.011773
5	2630.360	2841.625	2653.142	2899.233	0.3159912	-11.375	-11.375	24.011652
6	2623.935	2834.597	2647.868	2893.391	0.3159838	-11.398	-11.398	24.011223
7	2617.625	2827.738	2641.987	2886.948	0.3159844	-11.397	-11.397	24.011254
8	2611.173	2820.722	2636.288	2880.503	0.3159920	-11.373	-11.373	24.011696
9	2604.470	2813.450	2630.685	2874.489	0.3159946	-11.365	-11.365	24.011845
10	2597.629	2806.070	2624.995	2868.211	0.3159932	-11.369	-11.369	24.011766

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.374	0.008	0.003		5
d 37Cl/35Cl [per mil] vs. SMOC	-11.374	0.008	0.003	24.011662	5

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1934]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 106.91 mV,107.37 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 2776.8 Adjust: 2793.4 Sample is Master						

Dual Inlet Measurement Results EIGL Delta Plus XL

Tuesday, March 15, 2016 16:17:50

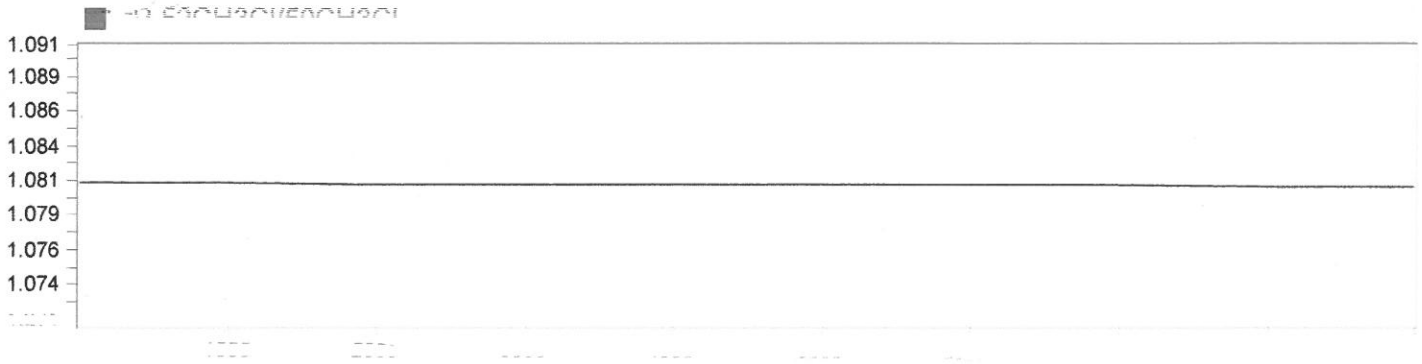
Line				Identifier 1	Identifier 2	Analysis	Comment	Method
1	X	X	X	J-1703	Colton17F 449	L-25836	b full Abe	CH3Cl dual inlet.

	Int.50 Sample [mV]	Int.52 Sample [mV]	Int.50 Standard [mV]	Int.52 Standard [mV]	R 52CH3Cl/50CH3	d 52CH3Cl/50CH3	d 37Cl/35Cl [per	AT% 37Cl/35Cl [%]
Pre			2759.068	3016.665				
1	2745.166	2967.634	2750.556	3007.454	0.3160192	-11.287	-11.287	24.013269
2	2735.650	2957.348	2743.198	2999.383	0.3160157	-11.298	-11.298	24.013065
3	2727.836	2948.792	2736.069	2991.534	0.3160083	-11.322	-11.322	24.012636
4	2719.844	2940.099	2729.857	2984.614	0.3160122	-11.309	-11.309	24.012863
5	2713.019	2932.647	2723.786	2978.020	0.3160087	-11.320	-11.320	24.012662
6	2705.553	2924.532	2717.736	2971.325	0.3160058	-11.330	-11.330	24.012491
7	2699.184	2917.582	2712.516	2965.613	0.3160032	-11.338	-11.338	24.012344
8	2692.921	2910.778	2707.242	2959.766	0.3160041	-11.335	-11.335	24.012394
9	2686.723	2904.030	2701.877	2953.945	0.3160007	-11.346	-11.346	24.012197
10	2680.037	2896.805	2696.093	2947.545	0.3160026	-11.339	-11.339	24.012310

	Mean	Std.Dev.	ST. Error	Atom%	Outlier
d 52CH3Cl/50CH3Cl [per mil] vs. CH3Cl	-11.328	0.011	0.004		3
d 37Cl/35Cl [per mil] vs. SMOC	-11.328	0.011	0.004	24.012529	3

Gas Configuration		Calibration	
Gas	CH3Cl	Mass [Dalton]	Dac [Steps]
Magnet [Steps]	12776	12.0	5765
Cups	1,2	28.0	8542
Masses	50.0,52.0	52.0	12776

Ref. Name:	d 37Cl/35Cl	vs.	Dual Inlet System			
CH3Cl	0.000	SMOC	Cycles	10	Idle time [s]	15.0
Infomation			PressAdjust Level [m	Right on Cup 1 (+/- 2	Pressadjust Delay [s	10.0
Peak Center found at [1941]			FV Threshold [mBar]	0.0300	FV Pump Time [s]	10.0
Background: 106.82 mV,107.24 mV			HV Pump Time [s]	60.0		
Pressure Adjustment: Master: 2880.9 Adjust: 2866.1 Sample is Master						



Line	Identifier 1	Identifier 2	Analysis	Comment	d 52CH3Cl/	d 52CH3Cl/	d 37Cl/35C	Is Ref _
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.902	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.884	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.895	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.885	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.875	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.878	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.889	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.903	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.911	0
2		FH-1	L-25844		-4.891	0.007	0	1
2		FH-1	L-25844		-4.891	0.007	-4.892	0
2		FH-1	L-25844		-4.891	0.007	0	1
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.847	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.855	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.847	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.841	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.849	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.845	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.862	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.861	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.829	0
1		FH-1	L-25843		-4.847	0.004	0	1
1		FH-1	L-25843		-4.847	0.004	-4.863	0
1		FH-1	L-25843		-4.847	0.004	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.729	0
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.759	0

1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.766	0
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.758	0
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.743	0
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	-10.75	0
1	J-1703	Colton17F	L-25842	a SPE	-10.752	0.007	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.348	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.336	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.312	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.299	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.253	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.174	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-11.068	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-10.985	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-10.905	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	-10.874	0
2	J-1703	Colton17F	L-25841	a SPE	-11.204	0.134	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.296	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.296	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.297	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.3	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.308	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.309	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.317	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.32	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1

1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.308	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	-11.31	0
1	J-1703	Colton17F	L-25840	a SPE	-11.307	0.004	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.447	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.45	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.448	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.452	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.456	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.453	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.465	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.447	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.472	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	-11.46	0
2	J-1703	Colton17F	L-25839	b full Abe	-11.451	0.005	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.43	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.422	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.414	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.425	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.417	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.44	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.432	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.442	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.439	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	-11.449	0
1	J-1703	Colton17F	L-25838	b full Abe	-11.433	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1

2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.394	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.387	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.365	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.368	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.375	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.398	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.397	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.373	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.365	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	-11.369	0
2	J-1703	Colton17F	L-25837	b full Abe	-11.374	0.008	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.287	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.298	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.322	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.309	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.32	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.33	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.338	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.335	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.346	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	-11.339	0
1	J-1703	Colton17F	L-25836	b full Abe	-11.328	0.011	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.06	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.119	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.113	0

2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.131	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.137	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.135	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.139	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.16	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.167	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	-90.152	0
2	J-132	RSIL-5	L-25835	1016B	-90.136	0.016	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.018	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.067	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.076	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.097	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.095	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.098	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.09	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.096	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.097	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	-90.116	0
1	J-132	RSIL-5	L-25834	1016B	-90.089	0.012	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.032	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.089	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.087	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.096	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.105	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1

2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.1	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.104	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.102	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.104	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	-90.127	0
2	J-132	RSIL-5	L-25833	1016B	-90.098	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.044	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.064	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.055	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.059	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.048	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.068	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.073	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.068	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.05	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	-90.071	0
1	J-132	RSIL-5	L-25832	1016B	-90.061	0.007	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.888	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.872	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.88	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.862	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.812	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.729	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.578	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.424	0

2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.304	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	-90.221	0
2	J-132	RSIL-5	L-25831	1016B	-90.756	0.17	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.846	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.879	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.886	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.88	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.883	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.879	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.88	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
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1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.9	0
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1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	-90.906	0
1	J-132	RSIL-5	L-25830	1016B	-90.882	0.004	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.81	0
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2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.784	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.778	0
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2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.782	0
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2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.761	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.761	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.78	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.772	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.777	0
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2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	-5.785	0
2	J-125	RSIL-4	L-25829	1016B	-5.78	0.005	0	1

1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.752	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.761	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.759	0
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1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.772	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.754	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.769	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.787	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
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1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.789	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	-5.756	0
1	J-125	RSIL-4	L-25828	1016B	-5.763	0.007	0	1

Peak Nr	Rt	Area 50	Area 52	Area All	Time	Date	Time Code	Preparatio
1					18:03:03	03/15/16	2016/03/15	18:03:03
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3					18:03:03	03/15/16	2016/03/15	18:03:03
4					18:03:03	03/15/16	2016/03/15	18:03:03
5					18:03:03	03/15/16	2016/03/15	18:03:03
6					18:03:03	03/15/16	2016/03/15	18:03:03
7					18:03:03	03/15/16	2016/03/15	18:03:03
8					18:03:03	03/15/16	2016/03/15	18:03:03
9					18:03:03	03/15/16	2016/03/15	18:03:03
10					18:03:03	03/15/16	2016/03/15	18:03:03
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12					18:03:03	03/15/16	2016/03/15	18:03:03
13					18:03:03	03/15/16	2016/03/15	18:03:03
14					18:03:03	03/15/16	2016/03/15	18:03:03
15					18:03:03	03/15/16	2016/03/15	18:03:03
16					18:03:03	03/15/16	2016/03/15	18:03:03
17					18:03:03	03/15/16	2016/03/15	18:03:03
18					18:03:03	03/15/16	2016/03/15	18:03:03
19					18:03:03	03/15/16	2016/03/15	18:03:03
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21					18:03:03	03/15/16	2016/03/15	18:03:03
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5					17:52:09	03/15/16	2016/03/15	17:52:09
6					17:52:09	03/15/16	2016/03/15	17:52:09
7					17:52:09	03/15/16	2016/03/15	17:52:09
8					17:52:09	03/15/16	2016/03/15	17:52:09
9					17:52:09	03/15/16	2016/03/15	17:52:09
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13					17:52:09	03/15/16	2016/03/15	17:52:09
14					17:52:09	03/15/16	2016/03/15	17:52:09
15					17:52:09	03/15/16	2016/03/15	17:52:09
16					17:52:09	03/15/16	2016/03/15	17:52:09
17					17:52:09	03/15/16	2016/03/15	17:52:09
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4					17:31:19	03/15/16	2016/03/15	17:31:19

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13	17:31:19	03/15/16	2016/03/15 17:31:19
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7	17:22:37	03/15/16	2016/03/15 17:22:37
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6	17:11:43	03/15/16	2016/03/15 17:11:43
7	17:11:43	03/15/16	2016/03/15 17:11:43
8	17:11:43	03/15/16	2016/03/15 17:11:43
9	17:11:43	03/15/16	2016/03/15 17:11:43
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13	17:11:43	03/15/16	2016/03/15 17:11:43
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7	16:53:25	03/15/16	2016/03/15 16:53:25
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13	16:53:25	03/15/16	2016/03/15 16:53:25
14	16:53:25	03/15/16	2016/03/15 16:53:25
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4	16:42:31	03/15/16	2016/03/15 16:42:31
5	16:42:31	03/15/16	2016/03/15 16:42:31
6	16:42:31	03/15/16	2016/03/15 16:42:31
7	16:42:31	03/15/16	2016/03/15 16:42:31
8	16:42:31	03/15/16	2016/03/15 16:42:31
9	16:42:31	03/15/16	2016/03/15 16:42:31
10	16:42:31	03/15/16	2016/03/15 16:42:31
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13	16:42:31	03/15/16	2016/03/15 16:42:31
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6	16:28:45	03/15/16	2016/03/15 16:28:45
7	16:28:45	03/15/16	2016/03/15 16:28:45
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13	16:28:45	03/15/16	2016/03/15 16:28:45
14	16:28:45	03/15/16	2016/03/15 16:28:45
15	16:28:45	03/15/16	2016/03/15 16:28:45
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8	16:17:50	03/15/16	2016/03/15 16:17:50
9	16:17:50	03/15/16	2016/03/15 16:17:50
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15	16:17:50	03/15/16	2016/03/15 16:17:50
16	16:17:50	03/15/16	2016/03/15 16:17:50
17	16:17:50	03/15/16	2016/03/15 16:17:50
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3	15:58:50	03/15/16	2016/03/15 15:58:50
4	15:58:50	03/15/16	2016/03/15 15:58:50
5	15:58:50	03/15/16	2016/03/15 15:58:50
6	15:58:50	03/15/16	2016/03/15 15:58:50

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8	15:58:50	03/15/16	2016/03/15 15:58:50
9	15:58:50	03/15/16	2016/03/15 15:58:50
10	15:58:50	03/15/16	2016/03/15 15:58:50
11	15:58:50	03/15/16	2016/03/15 15:58:50
12	15:58:50	03/15/16	2016/03/15 15:58:50
13	15:58:50	03/15/16	2016/03/15 15:58:50
14	15:58:50	03/15/16	2016/03/15 15:58:50
15	15:58:50	03/15/16	2016/03/15 15:58:50
16	15:58:50	03/15/16	2016/03/15 15:58:50
17	15:58:50	03/15/16	2016/03/15 15:58:50
18	15:58:50	03/15/16	2016/03/15 15:58:50
19	15:58:50	03/15/16	2016/03/15 15:58:50
20	15:58:50	03/15/16	2016/03/15 15:58:50
21	15:58:50	03/15/16	2016/03/15 15:58:50
1	15:47:40	03/15/16	2016/03/15 15:47:40
2	15:47:40	03/15/16	2016/03/15 15:47:40
3	15:47:40	03/15/16	2016/03/15 15:47:40
4	15:47:40	03/15/16	2016/03/15 15:47:40
5	15:47:40	03/15/16	2016/03/15 15:47:40
6	15:47:40	03/15/16	2016/03/15 15:47:40
7	15:47:40	03/15/16	2016/03/15 15:47:40
8	15:47:40	03/15/16	2016/03/15 15:47:40
9	15:47:40	03/15/16	2016/03/15 15:47:40
10	15:47:40	03/15/16	2016/03/15 15:47:40
11	15:47:40	03/15/16	2016/03/15 15:47:40
12	15:47:40	03/15/16	2016/03/15 15:47:40
13	15:47:40	03/15/16	2016/03/15 15:47:40
14	15:47:40	03/15/16	2016/03/15 15:47:40
15	15:47:40	03/15/16	2016/03/15 15:47:40
16	15:47:40	03/15/16	2016/03/15 15:47:40
17	15:47:40	03/15/16	2016/03/15 15:47:40
18	15:47:40	03/15/16	2016/03/15 15:47:40
19	15:47:40	03/15/16	2016/03/15 15:47:40
20	15:47:40	03/15/16	2016/03/15 15:47:40
21	15:47:40	03/15/16	2016/03/15 15:47:40
1	15:34:52	03/15/16	2016/03/15 15:34:52
2	15:34:52	03/15/16	2016/03/15 15:34:52
3	15:34:52	03/15/16	2016/03/15 15:34:52
4	15:34:52	03/15/16	2016/03/15 15:34:52
5	15:34:52	03/15/16	2016/03/15 15:34:52
6	15:34:52	03/15/16	2016/03/15 15:34:52
7	15:34:52	03/15/16	2016/03/15 15:34:52
8	15:34:52	03/15/16	2016/03/15 15:34:52
9	15:34:52	03/15/16	2016/03/15 15:34:52
10	15:34:52	03/15/16	2016/03/15 15:34:52
11	15:34:52	03/15/16	2016/03/15 15:34:52

12	15:34:52	03/15/16	2016/03/15 15:34:52
13	15:34:52	03/15/16	2016/03/15 15:34:52
14	15:34:52	03/15/16	2016/03/15 15:34:52
15	15:34:52	03/15/16	2016/03/15 15:34:52
16	15:34:52	03/15/16	2016/03/15 15:34:52
17	15:34:52	03/15/16	2016/03/15 15:34:52
18	15:34:52	03/15/16	2016/03/15 15:34:52
19	15:34:52	03/15/16	2016/03/15 15:34:52
20	15:34:52	03/15/16	2016/03/15 15:34:52
21	15:34:52	03/15/16	2016/03/15 15:34:52
1	15:23:41	03/15/16	2016/03/15 15:23:41
2	15:23:41	03/15/16	2016/03/15 15:23:41
3	15:23:41	03/15/16	2016/03/15 15:23:41
4	15:23:41	03/15/16	2016/03/15 15:23:41
5	15:23:41	03/15/16	2016/03/15 15:23:41
6	15:23:41	03/15/16	2016/03/15 15:23:41
7	15:23:41	03/15/16	2016/03/15 15:23:41
8	15:23:41	03/15/16	2016/03/15 15:23:41
9	15:23:41	03/15/16	2016/03/15 15:23:41
10	15:23:41	03/15/16	2016/03/15 15:23:41
11	15:23:41	03/15/16	2016/03/15 15:23:41
12	15:23:41	03/15/16	2016/03/15 15:23:41
13	15:23:41	03/15/16	2016/03/15 15:23:41
14	15:23:41	03/15/16	2016/03/15 15:23:41
15	15:23:41	03/15/16	2016/03/15 15:23:41
16	15:23:41	03/15/16	2016/03/15 15:23:41
17	15:23:41	03/15/16	2016/03/15 15:23:41
18	15:23:41	03/15/16	2016/03/15 15:23:41
19	15:23:41	03/15/16	2016/03/15 15:23:41
20	15:23:41	03/15/16	2016/03/15 15:23:41
21	15:23:41	03/15/16	2016/03/15 15:23:41
1	15:11:47	03/15/16	2016/03/15 15:11:47
2	15:11:47	03/15/16	2016/03/15 15:11:47
3	15:11:47	03/15/16	2016/03/15 15:11:47
4	15:11:47	03/15/16	2016/03/15 15:11:47
5	15:11:47	03/15/16	2016/03/15 15:11:47
6	15:11:47	03/15/16	2016/03/15 15:11:47
7	15:11:47	03/15/16	2016/03/15 15:11:47
8	15:11:47	03/15/16	2016/03/15 15:11:47
9	15:11:47	03/15/16	2016/03/15 15:11:47
10	15:11:47	03/15/16	2016/03/15 15:11:47
11	15:11:47	03/15/16	2016/03/15 15:11:47
12	15:11:47	03/15/16	2016/03/15 15:11:47
13	15:11:47	03/15/16	2016/03/15 15:11:47
14	15:11:47	03/15/16	2016/03/15 15:11:47
15	15:11:47	03/15/16	2016/03/15 15:11:47
16	15:11:47	03/15/16	2016/03/15 15:11:47

17	15:11:47	03/15/16	2016/03/15 15:11:47
18	15:11:47	03/15/16	2016/03/15 15:11:47
19	15:11:47	03/15/16	2016/03/15 15:11:47
20	15:11:47	03/15/16	2016/03/15 15:11:47
21	15:11:47	03/15/16	2016/03/15 15:11:47
1	15:00:37	03/15/16	2016/03/15 15:00:37
2	15:00:37	03/15/16	2016/03/15 15:00:37
3	15:00:37	03/15/16	2016/03/15 15:00:37
4	15:00:37	03/15/16	2016/03/15 15:00:37
5	15:00:37	03/15/16	2016/03/15 15:00:37
6	15:00:37	03/15/16	2016/03/15 15:00:37
7	15:00:37	03/15/16	2016/03/15 15:00:37
8	15:00:37	03/15/16	2016/03/15 15:00:37
9	15:00:37	03/15/16	2016/03/15 15:00:37
10	15:00:37	03/15/16	2016/03/15 15:00:37
11	15:00:37	03/15/16	2016/03/15 15:00:37
12	15:00:37	03/15/16	2016/03/15 15:00:37
13	15:00:37	03/15/16	2016/03/15 15:00:37
14	15:00:37	03/15/16	2016/03/15 15:00:37
15	15:00:37	03/15/16	2016/03/15 15:00:37
16	15:00:37	03/15/16	2016/03/15 15:00:37
17	15:00:37	03/15/16	2016/03/15 15:00:37
18	15:00:37	03/15/16	2016/03/15 15:00:37
19	15:00:37	03/15/16	2016/03/15 15:00:37
20	15:00:37	03/15/16	2016/03/15 15:00:37
21	15:00:37	03/15/16	2016/03/15 15:00:37
1	14:33:18	03/15/16	2016/03/15 14:33:18
2	14:33:18	03/15/16	2016/03/15 14:33:18
3	14:33:18	03/15/16	2016/03/15 14:33:18
4	14:33:18	03/15/16	2016/03/15 14:33:18
5	14:33:18	03/15/16	2016/03/15 14:33:18
6	14:33:18	03/15/16	2016/03/15 14:33:18
7	14:33:18	03/15/16	2016/03/15 14:33:18
8	14:33:18	03/15/16	2016/03/15 14:33:18
9	14:33:18	03/15/16	2016/03/15 14:33:18
10	14:33:18	03/15/16	2016/03/15 14:33:18
11	14:33:18	03/15/16	2016/03/15 14:33:18
12	14:33:18	03/15/16	2016/03/15 14:33:18
13	14:33:18	03/15/16	2016/03/15 14:33:18
14	14:33:18	03/15/16	2016/03/15 14:33:18
15	14:33:18	03/15/16	2016/03/15 14:33:18
16	14:33:18	03/15/16	2016/03/15 14:33:18
17	14:33:18	03/15/16	2016/03/15 14:33:18
18	14:33:18	03/15/16	2016/03/15 14:33:18
19	14:33:18	03/15/16	2016/03/15 14:33:18
20	14:33:18	03/15/16	2016/03/15 14:33:18
21	14:33:18	03/15/16	2016/03/15 14:33:18

1	14:22:02	03/15/16	2016/03/15 14:22:02
2	14:22:02	03/15/16	2016/03/15 14:22:02
3	14:22:02	03/15/16	2016/03/15 14:22:02
4	14:22:02	03/15/16	2016/03/15 14:22:02
5	14:22:02	03/15/16	2016/03/15 14:22:02
6	14:22:02	03/15/16	2016/03/15 14:22:02
7	14:22:02	03/15/16	2016/03/15 14:22:02
8	14:22:02	03/15/16	2016/03/15 14:22:02
9	14:22:02	03/15/16	2016/03/15 14:22:02
10	14:22:02	03/15/16	2016/03/15 14:22:02
11	14:22:02	03/15/16	2016/03/15 14:22:02
12	14:22:02	03/15/16	2016/03/15 14:22:02
13	14:22:02	03/15/16	2016/03/15 14:22:02
14	14:22:02	03/15/16	2016/03/15 14:22:02
15	14:22:02	03/15/16	2016/03/15 14:22:02
16	14:22:02	03/15/16	2016/03/15 14:22:02
17	14:22:02	03/15/16	2016/03/15 14:22:02
18	14:22:02	03/15/16	2016/03/15 14:22:02
19	14:22:02	03/15/16	2016/03/15 14:22:02
20	14:22:02	03/15/16	2016/03/15 14:22:02
21	14:22:02	03/15/16	2016/03/15 14:22:02

Method	rArea All	rArea 50	rIntensity 5	Ampl 50	BGD 50	rArea 52	rIntensity 5	Ampl 52
CH3Cl dual inlet.met		1911	1911			2088	2088	
CH3Cl dual inlet.met		1885	1885			2049	2049	
CH3Cl dual inlet.met		1907	1907			2083	2083	
CH3Cl dual inlet.met		1878	1878			2041	2041	
CH3Cl dual inlet.met		1903	1903			2079	2079	
CH3Cl dual inlet.met		1870	1870			2032	2032	
CH3Cl dual inlet.met		1900	1900			2074	2074	
CH3Cl dual inlet.met		1863	1863			2024	2024	
CH3Cl dual inlet.met		1896	1896			2071	2071	
CH3Cl dual inlet.met		1855	1855			2016	2016	
CH3Cl dual inlet.met		1893	1893			2067	2067	
CH3Cl dual inlet.met		1848	1848			2008	2008	
CH3Cl dual inlet.met		1889	1889			2063	2063	
CH3Cl dual inlet.met		1840	1840			2000	2000	
CH3Cl dual inlet.met		1885	1885			2059	2059	
CH3Cl dual inlet.met		1833	1833			1991	1991	
CH3Cl dual inlet.met		1881	1881			2055	2055	
CH3Cl dual inlet.met		1825	1825			1983	1983	
CH3Cl dual inlet.met		1878	1878			2051	2051	
CH3Cl dual inlet.met		1818	1818			1975	1975	
CH3Cl dual inlet.met		1875	1875			2047	2047	
CH3Cl dual inlet.met		1963	1963			2145	2145	
CH3Cl dual inlet.met		1987	1987			2161	2161	
CH3Cl dual inlet.met		1956	1956			2137	2137	
CH3Cl dual inlet.met		1978	1978			2151	2151	
CH3Cl dual inlet.met		1952	1952			2132	2132	
CH3Cl dual inlet.met		1969	1969			2141	2141	
CH3Cl dual inlet.met		1947	1947			2127	2127	
CH3Cl dual inlet.met		1960	1960			2131	2131	
CH3Cl dual inlet.met		1942	1942			2122	2122	
CH3Cl dual inlet.met		1952	1952			2123	2123	
CH3Cl dual inlet.met		1939	1939			2118	2118	
CH3Cl dual inlet.met		1944	1944			2114	2114	
CH3Cl dual inlet.met		1936	1936			2115	2115	
CH3Cl dual inlet.met		1938	1938			2106	2106	
CH3Cl dual inlet.met		1931	1931			2110	2110	
CH3Cl dual inlet.met		1929	1929			2097	2097	
CH3Cl dual inlet.met		1928	1928			2106	2106	
CH3Cl dual inlet.met		1921	1921			2089	2089	
CH3Cl dual inlet.met		1924	1924			2102	2102	
CH3Cl dual inlet.met		1914	1914			2080	2080	
CH3Cl dual inlet.met		1920	1920			2098	2098	
CH3Cl dual inlet.met		1904	1904			2080	2080	
CH3Cl dual inlet.met		1917	1917			2072	2072	
CH3Cl dual inlet.met		1900	1900			2076	2076	
CH3Cl dual inlet.met		1909	1909			2063	2063	

CH3Cl dual inlet.met	1896	1896	2071	2071
CH3Cl dual inlet.met	1900	1900	2053	2053
CH3Cl dual inlet.met	1892	1892	2067	2067
CH3Cl dual inlet.met	1892	1892	2044	2044
CH3Cl dual inlet.met	1889	1889	2063	2063
CH3Cl dual inlet.met	1883	1883	2035	2035
CH3Cl dual inlet.met	1885	1885	2059	2059
CH3Cl dual inlet.met	1874	1874	2025	2025
CH3Cl dual inlet.met	1881	1881	2055	2055
CH3Cl dual inlet.met	2096	2096	2290	2290
CH3Cl dual inlet.met	2067	2067	2232	2232
CH3Cl dual inlet.met	2091	2091	2284	2284
CH3Cl dual inlet.met	2057	2057	2221	2221
CH3Cl dual inlet.met	2087	2087	2279	2279
CH3Cl dual inlet.met	2048	2048	2211	2211
CH3Cl dual inlet.met	2083	2083	2275	2275
CH3Cl dual inlet.met	2037	2037	2199	2199
CH3Cl dual inlet.met	2079	2079	2271	2271
CH3Cl dual inlet.met	2024	2024	2185	2185
CH3Cl dual inlet.met	2075	2075	2266	2266
CH3Cl dual inlet.met	2009	2009	2170	2170
CH3Cl dual inlet.met	2070	2070	2261	2261
CH3Cl dual inlet.met	1995	1995	2155	2155
CH3Cl dual inlet.met	2066	2066	2257	2257
CH3Cl dual inlet.met	1982	1982	2142	2142
CH3Cl dual inlet.met	2062	2062	2253	2253
CH3Cl dual inlet.met	1971	1971	2129	2129
CH3Cl dual inlet.met	2059	2059	2249	2249
CH3Cl dual inlet.met	1960	1960	2118	2118
CH3Cl dual inlet.met	2054	2054	2244	2244
CH3Cl dual inlet.met	2154	2154	2353	2353
CH3Cl dual inlet.met	2191	2191	2367	2367
CH3Cl dual inlet.met	2146	2146	2345	2345
CH3Cl dual inlet.met	2179	2179	2354	2354
CH3Cl dual inlet.met	2141	2141	2339	2339
CH3Cl dual inlet.met	2168	2168	2342	2342
CH3Cl dual inlet.met	2136	2136	2333	2333
CH3Cl dual inlet.met	2158	2158	2331	2331
CH3Cl dual inlet.met	2131	2131	2329	2329
CH3Cl dual inlet.met	2148	2148	2320	2320
CH3Cl dual inlet.met	2127	2127	2324	2324
CH3Cl dual inlet.met	2138	2138	2310	2310
CH3Cl dual inlet.met	2122	2122	2318	2318
CH3Cl dual inlet.met	2129	2129	2299	2299
CH3Cl dual inlet.met	2118	2118	2314	2314
CH3Cl dual inlet.met	2119	2119	2289	2289
CH3Cl dual inlet.met	2114	2114	2310	2310

CH3Cl dual inlet.met	2109	2109	2279	2279
CH3Cl dual inlet.met	2110	2110	2305	2305
CH3Cl dual inlet.met	2100	2100	2269	2269
CH3Cl dual inlet.met	2106	2106	2301	2301
CH3Cl dual inlet.met	3241	3241	3541	3541
CH3Cl dual inlet.met	3227	3227	3485	3485
CH3Cl dual inlet.met	3232	3232	3531	3531
CH3Cl dual inlet.met	3215	3215	3472	3472
CH3Cl dual inlet.met	3221	3221	3519	3519
CH3Cl dual inlet.met	3203	3203	3459	3459
CH3Cl dual inlet.met	3212	3212	3509	3509
CH3Cl dual inlet.met	3191	3191	3447	3447
CH3Cl dual inlet.met	3202	3202	3498	3498
CH3Cl dual inlet.met	3180	3180	3434	3434
CH3Cl dual inlet.met	3193	3193	3488	3488
CH3Cl dual inlet.met	3169	3169	3422	3422
CH3Cl dual inlet.met	3184	3184	3478	3478
CH3Cl dual inlet.met	3157	3157	3410	3410
CH3Cl dual inlet.met	3175	3175	3468	3468
CH3Cl dual inlet.met	3146	3146	3397	3397
CH3Cl dual inlet.met	3166	3166	3458	3458
CH3Cl dual inlet.met	3135	3135	3386	3386
CH3Cl dual inlet.met	3156	3156	3448	3448
CH3Cl dual inlet.met	3124	3124	3373	3373
CH3Cl dual inlet.met	3147	3147	3438	3438
CH3Cl dual inlet.met	3363	3363	3675	3675
CH3Cl dual inlet.met	3376	3376	3647	3647
CH3Cl dual inlet.met	3352	3352	3663	3663
CH3Cl dual inlet.met	3363	3363	3633	3633
CH3Cl dual inlet.met	3342	3342	3652	3652
CH3Cl dual inlet.met	3351	3351	3620	3620
CH3Cl dual inlet.met	3332	3332	3641	3641
CH3Cl dual inlet.met	3339	3339	3607	3607
CH3Cl dual inlet.met	3322	3322	3630	3630
CH3Cl dual inlet.met	3327	3327	3594	3594
CH3Cl dual inlet.met	3313	3313	3619	3619
CH3Cl dual inlet.met	3315	3315	3581	3581
CH3Cl dual inlet.met	3303	3303	3609	3609
CH3Cl dual inlet.met	3303	3303	3567	3567
CH3Cl dual inlet.met	3293	3293	3598	3598
CH3Cl dual inlet.met	3291	3291	3555	3555
CH3Cl dual inlet.met	3284	3284	3588	3588
CH3Cl dual inlet.met	3280	3280	3543	3543
CH3Cl dual inlet.met	3274	3274	3577	3577
CH3Cl dual inlet.met	3269	3269	3530	3530
CH3Cl dual inlet.met	3265	3265	3567	3567
CH3Cl dual inlet.met	2683	2683	2932	2932

CH3Cl dual inlet.met	2658	2658	2871	2871
CH3Cl dual inlet.met	2677	2677	2925	2925
CH3Cl dual inlet.met	2651	2651	2864	2864
CH3Cl dual inlet.met	2670	2670	2918	2918
CH3Cl dual inlet.met	2644	2644	2856	2856
CH3Cl dual inlet.met	2665	2665	2912	2912
CH3Cl dual inlet.met	2637	2637	2849	2849
CH3Cl dual inlet.met	2659	2659	2906	2906
CH3Cl dual inlet.met	2630	2630	2842	2842
CH3Cl dual inlet.met	2653	2653	2899	2899
CH3Cl dual inlet.met	2624	2624	2835	2835
CH3Cl dual inlet.met	2648	2648	2893	2893
CH3Cl dual inlet.met	2618	2618	2828	2828
CH3Cl dual inlet.met	2642	2642	2887	2887
CH3Cl dual inlet.met	2611	2611	2821	2821
CH3Cl dual inlet.met	2636	2636	2881	2881
CH3Cl dual inlet.met	2604	2604	2813	2813
CH3Cl dual inlet.met	2631	2631	2874	2874
CH3Cl dual inlet.met	2598	2598	2806	2806
CH3Cl dual inlet.met	2625	2625	2868	2868
CH3Cl dual inlet.met	2759	2759	3017	3017
CH3Cl dual inlet.met	2745	2745	2968	2968
CH3Cl dual inlet.met	2751	2751	3007	3007
CH3Cl dual inlet.met	2736	2736	2957	2957
CH3Cl dual inlet.met	2743	2743	2999	2999
CH3Cl dual inlet.met	2728	2728	2949	2949
CH3Cl dual inlet.met	2736	2736	2992	2992
CH3Cl dual inlet.met	2720	2720	2940	2940
CH3Cl dual inlet.met	2730	2730	2985	2985
CH3Cl dual inlet.met	2713	2713	2933	2933
CH3Cl dual inlet.met	2724	2724	2978	2978
CH3Cl dual inlet.met	2706	2706	2925	2925
CH3Cl dual inlet.met	2718	2718	2971	2971
CH3Cl dual inlet.met	2699	2699	2918	2918
CH3Cl dual inlet.met	2713	2713	2966	2966
CH3Cl dual inlet.met	2693	2693	2911	2911
CH3Cl dual inlet.met	2707	2707	2960	2960
CH3Cl dual inlet.met	2687	2687	2904	2904
CH3Cl dual inlet.met	2702	2702	2954	2954
CH3Cl dual inlet.met	2680	2680	2897	2897
CH3Cl dual inlet.met	2696	2696	2948	2948
CH3Cl dual inlet.met	1422	1422	1555	1555
CH3Cl dual inlet.met	1415	1415	1408	1408
CH3Cl dual inlet.met	1420	1420	1552	1552
CH3Cl dual inlet.met	1409	1409	1402	1402
CH3Cl dual inlet.met	1418	1418	1550	1550
CH3Cl dual inlet.met	1403	1403	1396	1396

CH3Cl dual inlet.met	1416	1416	1548	1548
CH3Cl dual inlet.met	1398	1398	1391	1391
CH3Cl dual inlet.met	1414	1414	1546	1546
CH3Cl dual inlet.met	1392	1392	1385	1385
CH3Cl dual inlet.met	1412	1412	1544	1544
CH3Cl dual inlet.met	1387	1387	1380	1380
CH3Cl dual inlet.met	1411	1411	1542	1542
CH3Cl dual inlet.met	1381	1381	1374	1374
CH3Cl dual inlet.met	1409	1409	1540	1540
CH3Cl dual inlet.met	1376	1376	1369	1369
CH3Cl dual inlet.met	1407	1407	1538	1538
CH3Cl dual inlet.met	1371	1371	1363	1363
CH3Cl dual inlet.met	1406	1406	1537	1537
CH3Cl dual inlet.met	1365	1365	1358	1358
CH3Cl dual inlet.met	1404	1404	1535	1535
CH3Cl dual inlet.met	1488	1488	1626	1626
CH3Cl dual inlet.met	1493	1493	1485	1485
CH3Cl dual inlet.met	1485	1485	1624	1624
CH3Cl dual inlet.met	1487	1487	1479	1479
CH3Cl dual inlet.met	1483	1483	1621	1621
CH3Cl dual inlet.met	1480	1480	1473	1473
CH3Cl dual inlet.met	1481	1481	1619	1619
CH3Cl dual inlet.met	1474	1474	1466	1466
CH3Cl dual inlet.met	1479	1479	1617	1617
CH3Cl dual inlet.met	1468	1468	1460	1460
CH3Cl dual inlet.met	1477	1477	1615	1615
CH3Cl dual inlet.met	1462	1462	1454	1454
CH3Cl dual inlet.met	1475	1475	1613	1613
CH3Cl dual inlet.met	1456	1456	1448	1448
CH3Cl dual inlet.met	1473	1473	1610	1610
CH3Cl dual inlet.met	1450	1450	1442	1442
CH3Cl dual inlet.met	1472	1472	1609	1609
CH3Cl dual inlet.met	1444	1444	1436	1436
CH3Cl dual inlet.met	1470	1470	1606	1606
CH3Cl dual inlet.met	1438	1438	1430	1430
CH3Cl dual inlet.met	1468	1468	1604	1604
CH3Cl dual inlet.met	1592	1592	1740	1740
CH3Cl dual inlet.met	1588	1588	1580	1580
CH3Cl dual inlet.met	1589	1589	1738	1738
CH3Cl dual inlet.met	1582	1582	1574	1574
CH3Cl dual inlet.met	1587	1587	1735	1735
CH3Cl dual inlet.met	1575	1575	1567	1567
CH3Cl dual inlet.met	1585	1585	1733	1733
CH3Cl dual inlet.met	1569	1569	1561	1561
CH3Cl dual inlet.met	1583	1583	1731	1731
CH3Cl dual inlet.met	1563	1563	1555	1555
CH3Cl dual inlet.met	1581	1581	1729	1729

CH3Cl dual inlet.met	1556	1556	1548	1548
CH3Cl dual inlet.met	1579	1579	1726	1726
CH3Cl dual inlet.met	1550	1550	1542	1542
CH3Cl dual inlet.met	1577	1577	1724	1724
CH3Cl dual inlet.met	1544	1544	1536	1536
CH3Cl dual inlet.met	1575	1575	1722	1722
CH3Cl dual inlet.met	1537	1537	1529	1529
CH3Cl dual inlet.met	1574	1574	1720	1720
CH3Cl dual inlet.met	1531	1531	1523	1523
CH3Cl dual inlet.met	1571	1571	1718	1718
CH3Cl dual inlet.met	1667	1667	1822	1822
CH3Cl dual inlet.met	1677	1677	1668	1668
CH3Cl dual inlet.met	1664	1664	1819	1819
CH3Cl dual inlet.met	1669	1669	1661	1661
CH3Cl dual inlet.met	1662	1662	1817	1817
CH3Cl dual inlet.met	1662	1662	1654	1654
CH3Cl dual inlet.met	1660	1660	1815	1815
CH3Cl dual inlet.met	1655	1655	1646	1646
CH3Cl dual inlet.met	1658	1658	1813	1813
CH3Cl dual inlet.met	1648	1648	1639	1639
CH3Cl dual inlet.met	1655	1655	1810	1810
CH3Cl dual inlet.met	1641	1641	1633	1633
CH3Cl dual inlet.met	1653	1653	1808	1808
CH3Cl dual inlet.met	1634	1634	1626	1626
CH3Cl dual inlet.met	1651	1651	1805	1805
CH3Cl dual inlet.met	1627	1627	1619	1619
CH3Cl dual inlet.met	1650	1650	1804	1804
CH3Cl dual inlet.met	1621	1621	1612	1612
CH3Cl dual inlet.met	1647	1647	1801	1801
CH3Cl dual inlet.met	1614	1614	1606	1606
CH3Cl dual inlet.met	1645	1645	1799	1799
CH3Cl dual inlet.met	1806	1806	1974	1974
CH3Cl dual inlet.met	1814	1814	1802	1802
CH3Cl dual inlet.met	1802	1802	1970	1970
CH3Cl dual inlet.met	1806	1806	1794	1794
CH3Cl dual inlet.met	1800	1800	1967	1967
CH3Cl dual inlet.met	1797	1797	1785	1785
CH3Cl dual inlet.met	1798	1798	1964	1964
CH3Cl dual inlet.met	1788	1788	1777	1777
CH3Cl dual inlet.met	1795	1795	1962	1962
CH3Cl dual inlet.met	1777	1777	1765	1765
CH3Cl dual inlet.met	1793	1793	1960	1960
CH3Cl dual inlet.met	1763	1763	1752	1752
CH3Cl dual inlet.met	1791	1791	1958	1958
CH3Cl dual inlet.met	1750	1750	1739	1739
CH3Cl dual inlet.met	1789	1789	1956	1956
CH3Cl dual inlet.met	1737	1737	1727	1727

CH3Cl dual inlet.met	1787	1787	1953	1953
CH3Cl dual inlet.met	1726	1726	1717	1717
CH3Cl dual inlet.met	1785	1785	1951	1951
CH3Cl dual inlet.met	1716	1716	1707	1707
CH3Cl dual inlet.met	1782	1782	1948	1948
CH3Cl dual inlet.met	1899	1899	2077	2077
CH3Cl dual inlet.met	1921	1921	1910	1910
CH3Cl dual inlet.met	1894	1894	2070	2070
CH3Cl dual inlet.met	1911	1911	1900	1900
CH3Cl dual inlet.met	1890	1890	2066	2066
CH3Cl dual inlet.met	1902	1902	1890	1890
CH3Cl dual inlet.met	1887	1887	2063	2063
CH3Cl dual inlet.met	1893	1893	1882	1882
CH3Cl dual inlet.met	1884	1884	2060	2060
CH3Cl dual inlet.met	1884	1884	1873	1873
CH3Cl dual inlet.met	1881	1881	2057	2057
CH3Cl dual inlet.met	1876	1876	1865	1865
CH3Cl dual inlet.met	1878	1878	2054	2054
CH3Cl dual inlet.met	1868	1868	1857	1857
CH3Cl dual inlet.met	1876	1876	2051	2051
CH3Cl dual inlet.met	1860	1860	1849	1849
CH3Cl dual inlet.met	1874	1874	2048	2048
CH3Cl dual inlet.met	1853	1853	1841	1841
CH3Cl dual inlet.met	1872	1872	2046	2046
CH3Cl dual inlet.met	1845	1845	1834	1834
CH3Cl dual inlet.met	1869	1869	2044	2044
CH3Cl dual inlet.met	2263	2263	2475	2475
CH3Cl dual inlet.met	2280	2280	2479	2479
CH3Cl dual inlet.met	2259	2259	2471	2471
CH3Cl dual inlet.met	2269	2269	2467	2467
CH3Cl dual inlet.met	2256	2256	2466	2466
CH3Cl dual inlet.met	2258	2258	2455	2455
CH3Cl dual inlet.met	2252	2252	2463	2463
CH3Cl dual inlet.met	2248	2248	2443	2443
CH3Cl dual inlet.met	2249	2249	2459	2459
CH3Cl dual inlet.met	2237	2237	2432	2432
CH3Cl dual inlet.met	2245	2245	2455	2455
CH3Cl dual inlet.met	2227	2227	2421	2421
CH3Cl dual inlet.met	2242	2242	2452	2452
CH3Cl dual inlet.met	2217	2217	2410	2410
CH3Cl dual inlet.met	2239	2239	2448	2448
CH3Cl dual inlet.met	2206	2206	2398	2398
CH3Cl dual inlet.met	2235	2235	2444	2444
CH3Cl dual inlet.met	2196	2196	2387	2387
CH3Cl dual inlet.met	2232	2232	2440	2440
CH3Cl dual inlet.met	2186	2186	2376	2376
CH3Cl dual inlet.met	2229	2229	2436	2436

CH3Cl dual inlet.met	2419	2419	2646	2646
CH3Cl dual inlet.met	2443	2443	2657	2657
CH3Cl dual inlet.met	2413	2413	2639	2639
CH3Cl dual inlet.met	2427	2427	2639	2639
CH3Cl dual inlet.met	2409	2409	2635	2635
CH3Cl dual inlet.met	2412	2412	2623	2623
CH3Cl dual inlet.met	2405	2405	2630	2630
CH3Cl dual inlet.met	2399	2399	2608	2608
CH3Cl dual inlet.met	2401	2401	2626	2626
CH3Cl dual inlet.met	2385	2385	2594	2594
CH3Cl dual inlet.met	2398	2398	2622	2622
CH3Cl dual inlet.met	2373	2373	2580	2580
CH3Cl dual inlet.met	2394	2394	2618	2618
CH3Cl dual inlet.met	2361	2361	2567	2567
CH3Cl dual inlet.met	2391	2391	2614	2614
CH3Cl dual inlet.met	2349	2349	2554	2554
CH3Cl dual inlet.met	2387	2387	2610	2610
CH3Cl dual inlet.met	2337	2337	2541	2541
CH3Cl dual inlet.met	2383	2383	2606	2606
CH3Cl dual inlet.met	2325	2325	2528	2528
CH3Cl dual inlet.met	2380	2380	2603	2603

BGD 52	1	Cycle Int 1	Cycle Int 1	Cycle Int 1	Cycle Int r	R 52CH3Cl	R 52CH3Cl/	rd 52CH3Cl	d 52CH3Cl/
		1885	1911	2049	2088	1.092347	0.319627	0	0
		1885	1911	2049	2088	1.086907	0.31806	-4.902	-4.902
		1885	1911	2049	2088	1.092176	0.319627	0	0
		1885	1911	2049	2088	1.086807	0.318066	-4.884	-4.884
		1885	1911	2049	2088	1.092105	0.319627	0	0
		1885	1911	2049	2088	1.086746	0.318063	-4.895	-4.895
		1885	1911	2049	2088	1.092077	0.319627	0	0
		1885	1911	2049	2088	1.086732	0.318066	-4.885	-4.885
		1885	1911	2049	2088	1.092057	0.319627	0	0
		1885	1911	2049	2088	1.086727	0.318069	-4.875	-4.875
		1885	1911	2049	2088	1.092047	0.319627	0	0
		1885	1911	2049	2088	1.086715	0.318068	-4.878	-4.878
		1885	1911	2049	2088	1.092038	0.319627	0	0
		1885	1911	2049	2088	1.08671	0.318064	-4.889	-4.889
		1885	1911	2049	2088	1.09206	0.319627	0	0
		1885	1911	2049	2088	1.08671	0.31806	-4.903	-4.903
		1885	1911	2049	2088	1.092069	0.319627	0	0
		1885	1911	2049	2088	1.086698	0.318057	-4.911	-4.911
		1885	1911	2049	2088	1.092052	0.319627	0	0
		1885	1911	2049	2088	1.086712	0.318063	-4.892	-4.892
		1885	1911	2049	2088	1.092056	0.319627	0	0
		1987	1963	2161	2145	1.092522	0.319627	0	0
		1987	1963	2161	2145	1.087248	0.318078	-4.847	-4.847
		1987	1963	2161	2145	1.092567	0.319627	0	0
		1987	1963	2161	2145	1.087255	0.318075	-4.855	-4.855
		1987	1963	2161	2145	1.09255	0.319627	0	0
		1987	1963	2161	2145	1.087246	0.318078	-4.847	-4.847
		1987	1963	2161	2145	1.092534	0.319627	0	0
		1987	1963	2161	2145	1.087231	0.31808	-4.841	-4.841
		1987	1963	2161	2145	1.092505	0.319627	0	0
		1987	1963	2161	2145	1.087213	0.318077	-4.849	-4.849
		1987	1963	2161	2145	1.092516	0.319627	0	0
		1987	1963	2161	2145	1.087207	0.318078	-4.845	-4.845
		1987	1963	2161	2145	1.092485	0.319627	0	0
		1987	1963	2161	2145	1.087172	0.318073	-4.862	-4.862
		1987	1963	2161	2145	1.092483	0.319627	0	0
		1987	1963	2161	2145	1.087173	0.318073	-4.861	-4.861
		1987	1963	2161	2145	1.092483	0.319627	0	0
		1987	1963	2161	2145	1.087202	0.318084	-4.829	-4.829
		1987	1963	2161	2145	1.092471	0.319627	0	0
		1987	1963	2161	2145	1.087157	0.318073	-4.863	-4.863
		1987	1963	2161	2145	1.092469	0.319627	0	0
		1917	1904	2072	2080	1.092359	0.319627	0	0
		1917	1904	2072	2080	1.080702	0.316198	-10.729	-10.729
		1917	1904	2072	2080	1.092487	0.319627	0	0
		1917	1904	2072	2080	1.080721	0.316188	-10.759	-10.759

1917	1904	2072	2080	1.092463	0.319627	0	0
1917	1904	2072	2080	1.080677	0.316186	-10.766	-10.766
1917	1904	2072	2080	1.092416	0.319627	0	0
1917	1904	2072	2080	1.080653	0.316189	-10.758	-10.758
1917	1904	2072	2080	1.092393	0.319627	0	0
1917	1904	2072	2080	1.080649	0.316193	-10.743	-10.743
1917	1904	2072	2080	1.092377	0.319627	0	0
1917	1904	2072	2080	1.080634	0.316191	-10.75	-10.75
1917	1904	2072	2080	1.092378	0.319627	0	0
2067	2096	2232	2290	1.092487	0.319627	0	0
2067	2096	2232	2290	1.079971	0.316	-11.348	-11.348
2067	2096	2232	2290	1.092247	0.319627	0	0
2067	2096	2232	2290	1.079825	0.316004	-11.336	-11.336
2067	2096	2232	2290	1.092167	0.319627	0	0
2067	2096	2232	2290	1.079787	0.316011	-11.312	-11.312
2067	2096	2232	2290	1.092117	0.319627	0	0
2067	2096	2232	2290	1.07978	0.316016	-11.299	-11.299
2067	2096	2232	2290	1.092122	0.319627	0	0
2067	2096	2232	2290	1.079848	0.31603	-11.253	-11.253
2067	2096	2232	2290	1.092153	0.319627	0	0
2067	2096	2232	2290	1.079994	0.316056	-11.174	-11.174
2067	2096	2232	2290	1.092243	0.319627	0	0
2067	2096	2232	2290	1.080201	0.316089	-11.068	-11.068
2067	2096	2232	2290	1.092337	0.319627	0	0
2067	2096	2232	2290	1.080354	0.316116	-10.985	-10.985
2067	2096	2232	2290	1.09237	0.319627	0	0
2067	2096	2232	2290	1.080491	0.316141	-10.905	-10.905
2067	2096	2232	2290	1.092438	0.319627	0	0
2067	2096	2232	2290	1.08056	0.316151	-10.874	-10.874
2067	2096	2232	2290	1.09244	0.319627	0	0
2191	2154	2367	2353	1.092548	0.319627	0	0
2191	2154	2367	2353	1.080205	0.316016	-11.296	-11.296
2191	2154	2367	2353	1.092544	0.319627	0	0
2191	2154	2367	2353	1.080205	0.316017	-11.296	-11.296
2191	2154	2367	2353	1.092548	0.319627	0	0
2191	2154	2367	2353	1.080206	0.316016	-11.297	-11.297
2191	2154	2367	2353	1.09255	0.319627	0	0
2191	2154	2367	2353	1.080205	0.316015	-11.3	-11.3
2191	2154	2367	2353	1.092551	0.319627	0	0
2191	2154	2367	2353	1.080197	0.316013	-11.308	-11.308
2191	2154	2367	2353	1.092553	0.319627	0	0
2191	2154	2367	2353	1.080192	0.316012	-11.309	-11.309
2191	2154	2367	2353	1.092543	0.319627	0	0
2191	2154	2367	2353	1.080183	0.31601	-11.317	-11.317
2191	2154	2367	2353	1.092552	0.319627	0	0
2191	2154	2367	2353	1.080187	0.316009	-11.32	-11.32
2191	2154	2367	2353	1.092558	0.319627	0	0

2191	2154	2367	2353	1.080205	0.316013	-11.308	-11.308
2191	2154	2367	2353	1.092561	0.319627	0	0
2191	2154	2367	2353	1.080196	0.316012	-11.31	-11.31
2191	2154	2367	2353	1.092545	0.319627	0	0
3227	3241	3485	3541	1.092676	0.319627	0	0
3227	3241	3485	3541	1.080083	0.315968	-11.447	-11.447
3227	3241	3485	3541	1.092504	0.319627	0	0
3227	3241	3485	3541	1.079998	0.315967	-11.45	-11.45
3227	3241	3485	3541	1.092509	0.319627	0	0
3227	3241	3485	3541	1.079983	0.315968	-11.448	-11.448
3227	3241	3485	3541	1.09247	0.319627	0	0
3227	3241	3485	3541	1.079949	0.315967	-11.452	-11.452
3227	3241	3485	3541	1.092451	0.319627	0	0
3227	3241	3485	3541	1.079929	0.315965	-11.456	-11.456
3227	3241	3485	3541	1.092436	0.319627	0	0
3227	3241	3485	3541	1.079909	0.315966	-11.453	-11.453
3227	3241	3485	3541	1.092406	0.319627	0	0
3227	3241	3485	3541	1.079882	0.315963	-11.465	-11.465
3227	3241	3485	3541	1.092405	0.319627	0	0
3227	3241	3485	3541	1.079889	0.315968	-11.447	-11.447
3227	3241	3485	3541	1.092382	0.319627	0	0
3227	3241	3485	3541	1.079845	0.31596	-11.472	-11.472
3227	3241	3485	3541	1.092371	0.319627	0	0
3227	3241	3485	3541	1.079849	0.315964	-11.46	-11.46
3227	3241	3485	3541	1.092364	0.319627	0	0
3376	3363	3647	3675	1.092741	0.319627	0	0
3376	3363	3647	3675	1.080236	0.315974	-11.43	-11.43
3376	3363	3647	3675	1.092711	0.319627	0	0
3376	3363	3647	3675	1.080219	0.315976	-11.422	-11.422
3376	3363	3647	3675	1.092688	0.319627	0	0
3376	3363	3647	3675	1.080204	0.315979	-11.414	-11.414
3376	3363	3647	3675	1.092665	0.319627	0	0
3376	3363	3647	3675	1.080177	0.315975	-11.425	-11.425
3376	3363	3647	3675	1.092655	0.319627	0	0
3376	3363	3647	3675	1.080169	0.315978	-11.417	-11.417
3376	3363	3647	3675	1.092632	0.319627	0	0
3376	3363	3647	3675	1.080116	0.315971	-11.44	-11.44
3376	3363	3647	3675	1.0926	0.319627	0	0
3376	3363	3647	3675	1.080099	0.315973	-11.432	-11.432
3376	3363	3647	3675	1.09258	0.319627	0	0
3376	3363	3647	3675	1.08007	0.31597	-11.442	-11.442
3376	3363	3647	3675	1.092562	0.319627	0	0
3376	3363	3647	3675	1.080057	0.315971	-11.439	-11.439
3376	3363	3647	3675	1.092548	0.319627	0	0
3376	3363	3647	3675	1.080033	0.315968	-11.449	-11.449
3376	3363	3647	3675	1.092535	0.319627	0	0
2658	2683	2871	2932	1.092969	0.319627	0	0

2658	2683	2871	2932	1.080453	0.315985	-11.394	-11.394
2658	2683	2871	2932	1.09284	0.319627	0	0
2658	2683	2871	2932	1.080377	0.315987	-11.387	-11.387
2658	2683	2871	2932	1.092803	0.319627	0	0
2658	2683	2871	2932	1.080366	0.315994	-11.365	-11.365
2658	2683	2871	2932	1.092767	0.319627	0	0
2658	2683	2871	2932	1.080332	0.315993	-11.368	-11.368
2658	2683	2871	2932	1.092742	0.319627	0	0
2658	2683	2871	2932	1.080318	0.315991	-11.375	-11.375
2658	2683	2871	2932	1.092755	0.319627	0	0
2658	2683	2871	2932	1.080284	0.315984	-11.398	-11.398
2658	2683	2871	2932	1.092725	0.319627	0	0
2658	2683	2871	2932	1.080269	0.315984	-11.397	-11.397
2658	2683	2871	2932	1.092719	0.319627	0	0
2658	2683	2871	2932	1.080251	0.315992	-11.373	-11.373
2658	2683	2871	2932	1.092636	0.319627	0	0
2658	2683	2871	2932	1.080239	0.315995	-11.365	-11.365
2658	2683	2871	2932	1.092677	0.319627	0	0
2658	2683	2871	2932	1.080243	0.315993	-11.369	-11.369
2658	2683	2871	2932	1.092654	0.319627	0	0
2745	2759	2968	3017	1.093364	0.319627	0	0
2745	2759	2968	3017	1.08104	0.316019	-11.287	-11.287
2745	2759	2968	3017	1.093399	0.319627	0	0
2745	2759	2968	3017	1.08104	0.316016	-11.298	-11.298
2745	2759	2968	3017	1.093389	0.319627	0	0
2745	2759	2968	3017	1.081001	0.316008	-11.322	-11.322
2745	2759	2968	3017	1.093369	0.319627	0	0
2745	2759	2968	3017	1.080981	0.316012	-11.309	-11.309
2745	2759	2968	3017	1.093322	0.319627	0	0
2745	2759	2968	3017	1.080954	0.316009	-11.32	-11.32
2745	2759	2968	3017	1.093339	0.319627	0	0
2745	2759	2968	3017	1.080937	0.316006	-11.33	-11.33
2745	2759	2968	3017	1.093309	0.319627	0	0
2745	2759	2968	3017	1.080913	0.316003	-11.338	-11.338
2745	2759	2968	3017	1.093307	0.319627	0	0
2745	2759	2968	3017	1.0809	0.316004	-11.335	-11.335
2745	2759	2968	3017	1.093277	0.319627	0	0
2745	2759	2968	3017	1.080882	0.316001	-11.346	-11.346
2745	2759	2968	3017	1.093294	0.319627	0	0
2745	2759	2968	3017	1.080883	0.316003	-11.339	-11.339
2745	2759	2968	3017	1.093265	0.319627	0	0
1415	1422	1408	1555	1.093306	0.319627	0	0
1415	1422	1408	1555	0.994919	0.290841	-90.06	-90.06
1415	1422	1408	1555	1.093474	0.319627	0	0
1415	1422	1408	1555	0.994906	0.290823	-90.119	-90.119
1415	1422	1408	1555	1.093418	0.319627	0	0
1415	1422	1408	1555	0.994859	0.290824	-90.113	-90.113

1415	1422	1408	1555	1.093358	0.319627	0	0
1415	1422	1408	1555	0.994805	0.290819	-90.131	-90.131
1415	1422	1408	1555	1.093341	0.319627	0	0
1415	1422	1408	1555	0.994779	0.290817	-90.137	-90.137
1415	1422	1408	1555	1.093315	0.319627	0	0
1415	1422	1408	1555	0.99476	0.290817	-90.135	-90.135
1415	1422	1408	1555	1.093296	0.319627	0	0
1415	1422	1408	1555	0.994729	0.290816	-90.139	-90.139
1415	1422	1408	1555	1.093255	0.319627	0	0
1415	1422	1408	1555	0.994685	0.290809	-90.16	-90.16
1415	1422	1408	1555	1.09325	0.319627	0	0
1415	1422	1408	1555	0.994671	0.290807	-90.167	-90.167
1415	1422	1408	1555	1.093239	0.319627	0	0
1415	1422	1408	1555	0.994678	0.290812	-90.152	-90.152
1415	1422	1408	1555	1.093231	0.319627	0	0
1493	1488	1485	1626	1.092942	0.319627	0	0
1493	1488	1485	1626	0.994674	0.290855	-90.018	-90.018
1493	1488	1485	1626	1.093199	0.319627	0	0
1493	1488	1485	1626	0.994723	0.290839	-90.067	-90.067
1493	1488	1485	1626	1.093165	0.319627	0	0
1493	1488	1485	1626	0.994681	0.290836	-90.076	-90.076
1493	1488	1485	1626	1.09313	0.319627	0	0
1493	1488	1485	1626	0.994629	0.29083	-90.097	-90.097
1493	1488	1485	1626	1.0931	0.319627	0	0
1493	1488	1485	1626	0.994595	0.29083	-90.095	-90.095
1493	1488	1485	1626	1.093052	0.319627	0	0
1493	1488	1485	1626	0.994558	0.290829	-90.098	-90.098
1493	1488	1485	1626	1.093025	0.319627	0	0
1493	1488	1485	1626	0.994539	0.290832	-90.09	-90.09
1493	1488	1485	1626	1.092991	0.319627	0	0
1493	1488	1485	1626	0.994506	0.29083	-90.096	-90.096
1493	1488	1485	1626	1.092967	0.319627	0	0
1493	1488	1485	1626	0.994482	0.29083	-90.097	-90.097
1493	1488	1485	1626	1.092941	0.319627	0	0
1493	1488	1485	1626	0.994447	0.290824	-90.116	-90.116
1493	1488	1485	1626	1.092934	0.319627	0	0
1588	1592	1580	1740	1.09324	0.319627	0	0
1588	1592	1580	1740	0.994892	0.290851	-90.032	-90.032
1588	1592	1580	1740	1.093413	0.319627	0	0
1588	1592	1580	1740	0.994888	0.290832	-90.089	-90.089
1588	1592	1580	1740	1.093369	0.319627	0	0
1588	1592	1580	1740	0.994856	0.290833	-90.087	-90.087
1588	1592	1580	1740	1.093339	0.319627	0	0
1588	1592	1580	1740	0.994824	0.29083	-90.096	-90.096
1588	1592	1580	1740	1.093317	0.319627	0	0
1588	1592	1580	1740	0.994786	0.290827	-90.105	-90.105
1588	1592	1580	1740	1.093278	0.319627	0	0

1588	1592	1580	1740	0.994775	0.290829	-90.1	-90.1
1588	1592	1580	1740	1.09328	0.319627	0	0
1588	1592	1580	1740	0.99475	0.290827	-90.104	-90.104
1588	1592	1580	1740	1.093234	0.319627	0	0
1588	1592	1580	1740	0.994735	0.290828	-90.102	-90.102
1588	1592	1580	1740	1.093243	0.319627	0	0
1588	1592	1580	1740	0.994721	0.290827	-90.104	-90.104
1588	1592	1580	1740	1.093208	0.319627	0	0
1588	1592	1580	1740	0.994675	0.29082	-90.127	-90.127
1588	1592	1580	1740	1.093197	0.319627	0	0
1677	1667	1668	1822	1.09316	0.319627	0	0
1677	1667	1668	1822	0.994863	0.290846	-90.044	-90.044
1677	1667	1668	1822	1.09346	0.319627	0	0
1677	1667	1668	1822	0.994979	0.29084	-90.064	-90.064
1677	1667	1668	1822	1.093462	0.319627	0	0
1677	1667	1668	1822	0.994983	0.290843	-90.055	-90.055
1677	1667	1668	1822	1.093446	0.319627	0	0
1677	1667	1668	1822	0.99496	0.290842	-90.059	-90.059
1677	1667	1668	1822	1.093421	0.319627	0	0
1677	1667	1668	1822	0.994954	0.290845	-90.048	-90.048
1677	1667	1668	1822	1.093408	0.319627	0	0
1677	1667	1668	1822	0.994925	0.290839	-90.068	-90.068
1677	1667	1668	1822	1.093404	0.319627	0	0
1677	1667	1668	1822	0.994908	0.290837	-90.073	-90.073
1677	1667	1668	1822	1.093383	0.319627	0	0
1677	1667	1668	1822	0.994888	0.290839	-90.068	-90.068
1677	1667	1668	1822	1.093349	0.319627	0	0
1677	1667	1668	1822	0.994897	0.290845	-90.05	-90.05
1677	1667	1668	1822	1.093357	0.319627	0	0
1677	1667	1668	1822	0.994876	0.290838	-90.071	-90.071
1677	1667	1668	1822	1.093353	0.319627	0	0
1814	1806	1802	1974	1.093102	0.319627	0	0
1814	1806	1802	1974	0.993655	0.290577	-90.888	-90.888
1814	1806	1802	1974	1.092887	0.319627	0	0
1814	1806	1802	1974	0.993547	0.290582	-90.872	-90.872
1814	1806	1802	1974	1.092829	0.319627	0	0
1814	1806	1802	1974	0.993499	0.290579	-90.88	-90.88
1814	1806	1802	1974	1.0928	0.319627	0	0
1814	1806	1802	1974	0.993504	0.290585	-90.862	-90.862
1814	1806	1802	1974	1.092796	0.319627	0	0
1814	1806	1802	1974	0.993579	0.290601	-90.812	-90.812
1814	1806	1802	1974	1.092845	0.319627	0	0
1814	1806	1802	1974	0.993742	0.290627	-90.729	-90.729
1814	1806	1802	1974	1.092956	0.319627	0	0
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1814	1806	1802	1974	1.093107	0.319627	0	0
1814	1806	1802	1974	0.994323	0.290725	-90.424	-90.424

1814	1806	1802	1974	1.093237	0.319627	0	0
1814	1806	1802	1974	0.994539	0.290763	-90.304	-90.304
1814	1806	1802	1974	1.093295	0.319627	0	0
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1814	1806	1802	1974	1.093359	0.319627	0	0
1921	1899	1910	2077	1.093394	0.319627	0	0
1921	1899	1910	2077	0.994058	0.29059	-90.846	-90.846
1921	1899	1910	2077	1.093382	0.319627	0	0
1921	1899	1910	2077	0.994012	0.29058	-90.879	-90.879
1921	1899	1910	2077	1.093372	0.319627	0	0
1921	1899	1910	2077	0.993992	0.290577	-90.886	-90.886
1921	1899	1910	2077	1.093356	0.319627	0	0
1921	1899	1910	2077	0.993993	0.290579	-90.88	-90.88
1921	1899	1910	2077	1.093357	0.319627	0	0
1921	1899	1910	2077	0.993976	0.290579	-90.883	-90.883
1921	1899	1910	2077	1.093327	0.319627	0	0
1921	1899	1910	2077	0.993954	0.29058	-90.879	-90.879
1921	1899	1910	2077	1.0933	0.319627	0	0
1921	1899	1910	2077	0.993936	0.290579	-90.88	-90.88
1921	1899	1910	2077	1.093288	0.319627	0	0
1921	1899	1910	2077	0.993908	0.290576	-90.89	-90.89
1921	1899	1910	2077	1.093263	0.319627	0	0
1921	1899	1910	2077	0.993884	0.290573	-90.9	-90.9
1921	1899	1910	2077	1.09326	0.319627	0	0
1921	1899	1910	2077	0.993874	0.290571	-90.906	-90.906
1921	1899	1910	2077	1.093256	0.319627	0	0
2280	2263	2479	2475	1.09369	0.319627	0	0
2280	2263	2479	2475	1.087258	0.31777	-5.81	-5.81
2280	2263	2479	2475	1.093534	0.319627	0	0
2280	2263	2479	2475	1.087162	0.317778	-5.784	-5.784
2280	2263	2479	2475	1.093441	0.319627	0	0
2280	2263	2479	2475	1.087111	0.31778	-5.778	-5.778
2280	2263	2479	2475	1.093418	0.319627	0	0
2280	2263	2479	2475	1.087077	0.317779	-5.782	-5.782
2280	2263	2479	2475	1.093379	0.319627	0	0
2280	2263	2479	2475	1.087068	0.317786	-5.761	-5.761
2280	2263	2479	2475	1.093355	0.319627	0	0
2280	2263	2479	2475	1.087044	0.317786	-5.761	-5.761
2280	2263	2479	2475	1.09333	0.319627	0	0
2280	2263	2479	2475	1.086998	0.317779	-5.78	-5.78
2280	2263	2479	2475	1.093306	0.319627	0	0
2280	2263	2479	2475	1.086985	0.317782	-5.772	-5.772
2280	2263	2479	2475	1.093284	0.319627	0	0
2280	2263	2479	2475	1.086956	0.317781	-5.777	-5.777
2280	2263	2479	2475	1.093259	0.319627	0	0
2280	2263	2479	2475	1.08692	0.317778	-5.785	-5.785
2280	2263	2479	2475	1.09323	0.319627	0	0

2443	2419	2657	2646	1.093724	0.319627	0	0
2443	2419	2657	2646	1.087418	0.317789	-5.752	-5.752
2443	2419	2657	2646	1.093693	0.319627	0	0
2443	2419	2657	2646	1.087373	0.317786	-5.761	-5.761
2443	2419	2657	2646	1.093654	0.319627	0	0
2443	2419	2657	2646	1.087346	0.317786	-5.759	-5.759
2443	2419	2657	2646	1.093635	0.319627	0	0
2443	2419	2657	2646	1.087307	0.317782	-5.772	-5.772
2443	2419	2657	2646	1.093603	0.319627	0	0
2443	2419	2657	2646	1.087311	0.317788	-5.754	-5.754
2443	2419	2657	2646	1.093605	0.319627	0	0
2443	2419	2657	2646	1.087277	0.317783	-5.769	-5.769
2443	2419	2657	2646	1.093567	0.319627	0	0
2443	2419	2657	2646	1.087238	0.317777	-5.787	-5.787
2443	2419	2657	2646	1.093564	0.319627	0	0
2443	2419	2657	2646	1.08725	0.317783	-5.77	-5.77
2443	2419	2657	2646	1.093557	0.319627	0	0
2443	2419	2657	2646	1.087211	0.317777	-5.789	-5.789
2443	2419	2657	2646	1.093525	0.319627	0	0
2443	2419	2657	2646	1.087228	0.317787	-5.756	-5.756
2443	2419	2657	2646	1.09352	0.319627	0	0

d 37Cl/35C	R 37Cl/35C	AT% 37Cl/3	Magnet Va	Gasconfigu	Backgroun	Pressadjust	BGD Detection
		24.22101	12776	CH3Cl	1	1	
		24.13092	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13127	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13107	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13124	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13142	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13137	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13116	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13091	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13076	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13111	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13193	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.1318	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13194	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13206	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
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		24.22101	12776	CH3Cl	1	1	
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		24.13169	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13227	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.13165	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.22101	12776	CH3Cl	1	1	
		24.02356	12776	CH3Cl	1	1	
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24.22101	12776	CH3Cl	1	1
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24.01289	12776	CH3Cl	1	1
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24.22101	12776	CH3Cl	1	1
24.22101	12776	CH3Cl	1	1
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Analysis	Line	Identifier 1	Identifier 2	Comment	Is Ref _	Peak Nr	d 18O/16O	d 18O/16O
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L-25668	1	G-22	125-1016A		0	2	-37.263	0.018
L-25668	1	G-22	125-1016A		1	3	-37.263	0.018
L-25668	1	G-22	125-1016A		0	4	-37.263	0.018
L-25668	1	G-22	125-1016A		1	5	-37.263	0.018
L-25668	1	G-22	125-1016A		0	6	-37.263	0.018
L-25668	1	G-22	125-1016A		1	7	-37.263	0.018
L-25668	1	G-22	125-1016A		0	8	-37.263	0.018
L-25668	1	G-22	125-1016A		1	9	-37.263	0.018
L-25668	1	G-22	125-1016A		0	10	-37.263	0.018
L-25668	1	G-22	125-1016A		1	11	-37.263	0.018
L-25668	1	G-22	125-1016A		0	12	-37.263	0.018
L-25668	1	G-22	125-1016A		1	13	-37.263	0.018
L-25668	1	G-22	125-1016A		0	14	-37.263	0.018
L-25668	1	G-22	125-1016A		1	15	-37.263	0.018
L-25668	1	G-22	125-1016A		0	16	-37.263	0.018
L-25668	1	G-22	125-1016A		1	17	-37.263	0.018
L-25668	1	G-22	125-1016A		0	18	-37.263	0.018
L-25668	1	G-22	125-1016A		1	19	-37.263	0.018
L-25668	1	G-22	125-1016A		0	20	-37.263	0.018
L-25668	1	G-22	125-1016A		1	21	-37.263	0.018
L-25669	2	G-22	125-1016A		1	1	-37.282	0.014
L-25669	2	G-22	125-1016A		0	2	-37.282	0.014
L-25669	2	G-22	125-1016A		1	3	-37.282	0.014
L-25669	2	G-22	125-1016A		0	4	-37.282	0.014
L-25669	2	G-22	125-1016A		1	5	-37.282	0.014
L-25669	2	G-22	125-1016A		0	6	-37.282	0.014
L-25669	2	G-22	125-1016A		1	7	-37.282	0.014
L-25669	2	G-22	125-1016A		0	8	-37.282	0.014
L-25669	2	G-22	125-1016A		1	9	-37.282	0.014
L-25669	2	G-22	125-1016A		0	10	-37.282	0.014
L-25669	2	G-22	125-1016A		1	11	-37.282	0.014
L-25669	2	G-22	125-1016A		0	12	-37.282	0.014
L-25669	2	G-22	125-1016A		1	13	-37.282	0.014
L-25669	2	G-22	125-1016A		0	14	-37.282	0.014
L-25669	2	G-22	125-1016A		1	15	-37.282	0.014
L-25669	2	G-22	125-1016A		0	16	-37.282	0.014
L-25669	2	G-22	125-1016A		1	17	-37.282	0.014
L-25669	2	G-22	125-1016A		0	18	-37.282	0.014
L-25669	2	G-22	125-1016A		1	19	-37.282	0.014
L-25669	2	G-22	125-1016A		0	20	-37.282	0.014
L-25669	2	G-22	125-1016A		1	21	-37.282	0.014
L-25670	1	G-23	132-1016A		1	1	18.119	0.011
L-25670	1	G-23	132-1016A		0	2	18.119	0.011
L-25670	1	G-23	132-1016A		1	3	18.119	0.011
L-25670	1	G-23	132-1016A		0	4	18.119	0.011
L-25670	1	G-23	132-1016A		1	5	18.119	0.011
L-25670	1	G-23	132-1016A		0	6	18.119	0.011
L-25670	1	G-23	132-1016A		1	7	18.119	0.011
L-25670	1	G-23	132-1016A		0	8	18.119	0.011
L-25670	1	G-23	132-1016A		1	9	18.119	0.011

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L-25670	1 G-23	132-1016A	1	17	18.119	0.011
L-25670	1 G-23	132-1016A	0	18	18.119	0.011
L-25670	1 G-23	132-1016A	1	19	18.119	0.011
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L-25671	2 G-23	132-1016A	1	1	18.152	0.011
L-25671	2 G-23	132-1016A	0	2	18.152	0.011
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L-25671	2 G-23	132-1016A	0	4	18.152	0.011
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L-25671	2 G-23	132-1016A	0	6	18.152	0.011
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L-25672	1 G-23	132-1016A	0	2	18.131	0.025
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L-25672	1 G-23	132-1016A	0	4	18.131	0.025
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L-25673	2 G-23	132-1016A	1	1	18.163	0.013
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L-25673	2 G-23	132-1016A	0	16	18.163	0.013
L-25673	2 G-23	132-1016A	1	17	18.163	0.013
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L-25673	2 G-23	132-1016A	0	20	18.163	0.013
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L-25674	1 G-23	132-1016A	1	1	18.199	0.007
L-25674	1 G-23	132-1016A	0	2	18.199	0.007
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L-25674	1 G-23	132-1016A	0	6	18.199	0.007
L-25674	1 G-23	132-1016A	1	7	18.199	0.007
L-25674	1 G-23	132-1016A	0	8	18.199	0.007
L-25674	1 G-23	132-1016A	1	9	18.199	0.007
L-25674	1 G-23	132-1016A	0	10	18.199	0.007
L-25674	1 G-23	132-1016A	1	11	18.199	0.007
L-25674	1 G-23	132-1016A	0	12	18.199	0.007
L-25674	1 G-23	132-1016A	1	13	18.199	0.007
L-25674	1 G-23	132-1016A	0	14	18.199	0.007
L-25674	1 G-23	132-1016A	1	15	18.199	0.007
L-25674	1 G-23	132-1016A	0	16	18.199	0.007
L-25674	1 G-23	132-1016A	1	17	18.199	0.007
L-25674	1 G-23	132-1016A	0	18	18.199	0.007
L-25674	1 G-23	132-1016A	1	19	18.199	0.007
L-25674	1 G-23	132-1016A	0	20	18.199	0.007
L-25674	1 G-23	132-1016A	1	21	18.199	0.007
L-25674	1 G-23	132-1016A	1	1	18.199	0.007
L-25674	1 G-23	132-1016A	0	2	18.199	0.007
L-25674	1 G-23	132-1016A	1	3	18.199	0.007
L-25674	1 G-23	132-1016A	0	4	18.199	0.007
L-25674	1 G-23	132-1016A	1	5	18.199	0.007
L-25674	1 G-23	132-1016A	0	6	18.199	0.007
L-25674	1 G-23	132-1016A	1	7	18.199	0.007
L-25674	1 G-23	132-1016A	0	8	18.199	0.007

L-25674	1 G-23	132-1016A	1	9	18.199	0.007
L-25674	1 G-23	132-1016A	0	10	18.199	0.007
L-25674	1 G-23	132-1016A	1	11	18.199	0.007
L-25674	1 G-23	132-1016A	0	12	18.199	0.007
L-25674	1 G-23	132-1016A	1	13	18.199	0.007
L-25674	1 G-23	132-1016A	0	14	18.199	0.007
L-25674	1 G-23	132-1016A	1	15	18.199	0.007
L-25674	1 G-23	132-1016A	0	16	18.199	0.007
L-25674	1 G-23	132-1016A	1	17	18.199	0.007
L-25674	1 G-23	132-1016A	0	18	18.199	0.007
L-25674	1 G-23	132-1016A	1	19	18.199	0.007
L-25674	1 G-23	132-1016A	0	20	18.199	0.007
L-25674	1 G-23	132-1016A	1	21	18.199	0.007
L-25675	2 G-23	132-1016A	1	1	18.203	0.027
L-25675	2 G-23	132-1016A	0	2	18.203	0.027
L-25675	2 G-23	132-1016A	1	3	18.203	0.027
L-25675	2 G-23	132-1016A	0	4	18.203	0.027
L-25675	2 G-23	132-1016A	1	5	18.203	0.027
L-25675	2 G-23	132-1016A	0	6	18.203	0.027
L-25675	2 G-23	132-1016A	1	7	18.203	0.027
L-25675	2 G-23	132-1016A	0	8	18.203	0.027
L-25675	2 G-23	132-1016A	1	9	18.203	0.027
L-25675	2 G-23	132-1016A	0	10	18.203	0.027
L-25675	2 G-23	132-1016A	1	11	18.203	0.027
L-25675	2 G-23	132-1016A	0	12	18.203	0.027
L-25675	2 G-23	132-1016A	1	13	18.203	0.027
L-25675	2 G-23	132-1016A	0	14	18.203	0.027
L-25675	2 G-23	132-1016A	1	15	18.203	0.027
L-25675	2 G-23	132-1016A	0	16	18.203	0.027
L-25675	2 G-23	132-1016A	1	17	18.203	0.027
L-25675	2 G-23	132-1016A	0	18	18.203	0.027
L-25675	2 G-23	132-1016A	1	19	18.203	0.027
L-25675	2 G-23	132-1016A	0	20	18.203	0.027
L-25675	2 G-23	132-1016A	1	21	18.203	0.027
L-25675	2 G-23	132-1016A	1	1	18.203	0.027
L-25675	2 G-23	132-1016A	0	2	18.203	0.027
L-25675	2 G-23	132-1016A	1	3	18.203	0.027
L-25675	2 G-23	132-1016A	0	4	18.203	0.027
L-25675	2 G-23	132-1016A	1	5	18.203	0.027
L-25675	2 G-23	132-1016A	0	6	18.203	0.027
L-25675	2 G-23	132-1016A	1	7	18.203	0.027
L-25675	2 G-23	132-1016A	0	8	18.203	0.027
L-25675	2 G-23	132-1016A	1	9	18.203	0.027
L-25675	2 G-23	132-1016A	0	10	18.203	0.027
L-25675	2 G-23	132-1016A	1	11	18.203	0.027
L-25675	2 G-23	132-1016A	0	12	18.203	0.027
L-25675	2 G-23	132-1016A	1	13	18.203	0.027
L-25675	2 G-23	132-1016A	0	14	18.203	0.027
L-25675	2 G-23	132-1016A	1	15	18.203	0.027
L-25675	2 G-23	132-1016A	0	16	18.203	0.027
L-25675	2 G-23	132-1016A	1	17	18.203	0.027
L-25675	2 G-23	132-1016A	0	18	18.203	0.027

L-25675	2	G-23	132-1016A	1	19	18.203	0.027
L-25675	2	G-23	132-1016A	0	20	18.203	0.027
L-25675	2	G-23	132-1016A	1	21	18.203	0.027
L-25676	1	G-23	132-1016A	1	1	18.258	0.026
L-25676	1	G-23	132-1016A	0	2	18.258	0.026
L-25676	1	G-23	132-1016A	1	3	18.258	0.026
L-25676	1	G-23	132-1016A	0	4	18.258	0.026
L-25676	1	G-23	132-1016A	1	5	18.258	0.026
L-25676	1	G-23	132-1016A	0	6	18.258	0.026
L-25676	1	G-23	132-1016A	1	7	18.258	0.026
L-25676	1	G-23	132-1016A	0	8	18.258	0.026
L-25676	1	G-23	132-1016A	1	9	18.258	0.026
L-25676	1	G-23	132-1016A	0	10	18.258	0.026
L-25676	1	G-23	132-1016A	1	11	18.258	0.026
L-25676	1	G-23	132-1016A	0	12	18.258	0.026
L-25676	1	G-23	132-1016A	1	13	18.258	0.026
L-25676	1	G-23	132-1016A	0	14	18.258	0.026
L-25676	1	G-23	132-1016A	1	15	18.258	0.026
L-25676	1	G-23	132-1016A	0	16	18.258	0.026
L-25676	1	G-23	132-1016A	1	17	18.258	0.026
L-25676	1	G-23	132-1016A	0	18	18.258	0.026
L-25676	1	G-23	132-1016A	1	19	18.258	0.026
L-25676	1	G-23	132-1016A	0	20	18.258	0.026
L-25676	1	G-23	132-1016A	1	21	18.258	0.026
L-25676	1	G-23	132-1016A	1	1	18.258	0.026
L-25676	1	G-23	132-1016A	0	2	18.258	0.026
L-25676	1	G-23	132-1016A	1	3	18.258	0.026
L-25676	1	G-23	132-1016A	0	4	18.258	0.026
L-25676	1	G-23	132-1016A	1	5	18.258	0.026
L-25676	1	G-23	132-1016A	0	6	18.258	0.026
L-25676	1	G-23	132-1016A	1	7	18.258	0.026
L-25676	1	G-23	132-1016A	0	8	18.258	0.026
L-25676	1	G-23	132-1016A	1	9	18.258	0.026
L-25676	1	G-23	132-1016A	0	10	18.258	0.026
L-25676	1	G-23	132-1016A	1	11	18.258	0.026
L-25676	1	G-23	132-1016A	0	12	18.258	0.026
L-25676	1	G-23	132-1016A	1	13	18.258	0.026
L-25676	1	G-23	132-1016A	0	14	18.258	0.026
L-25676	1	G-23	132-1016A	1	15	18.258	0.026
L-25676	1	G-23	132-1016A	0	16	18.258	0.026
L-25676	1	G-23	132-1016A	1	17	18.258	0.026
L-25676	1	G-23	132-1016A	0	18	18.258	0.026
L-25676	1	G-23	132-1016A	1	19	18.258	0.026
L-25676	1	G-23	132-1016A	0	20	18.258	0.026
L-25676	1	G-23	132-1016A	1	21	18.258	0.026
L-25677	2	G-23	132-1016A	1	1	18.236	0.019
L-25677	2	G-23	132-1016A	0	2	18.236	0.019
L-25677	2	G-23	132-1016A	1	3	18.236	0.019
L-25677	2	G-23	132-1016A	0	4	18.236	0.019
L-25677	2	G-23	132-1016A	1	5	18.236	0.019
L-25677	2	G-23	132-1016A	0	6	18.236	0.019
L-25677	2	G-23	132-1016A	1	7	18.236	0.019

L-25677	2 G-23	132-1016A	0	8	18.236	0.019
L-25677	2 G-23	132-1016A	1	9	18.236	0.019
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L-25677	2 G-23	132-1016A	0	14	18.236	0.019
L-25677	2 G-23	132-1016A	1	15	18.236	0.019
L-25677	2 G-23	132-1016A	0	16	18.236	0.019
L-25677	2 G-23	132-1016A	1	17	18.236	0.019
L-25677	2 G-23	132-1016A	0	18	18.236	0.019
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L-25677	2 G-23	132-1016A	0	20	18.236	0.019
L-25677	2 G-23	132-1016A	1	21	18.236	0.019
L-25677	2 G-23	132-1016A	1	1	18.236	0.019
L-25677	2 G-23	132-1016A	0	2	18.236	0.019
L-25677	2 G-23	132-1016A	1	3	18.236	0.019
L-25677	2 G-23	132-1016A	0	4	18.236	0.019
L-25677	2 G-23	132-1016A	1	5	18.236	0.019
L-25677	2 G-23	132-1016A	0	6	18.236	0.019
L-25677	2 G-23	132-1016A	1	7	18.236	0.019
L-25677	2 G-23	132-1016A	0	8	18.236	0.019
L-25677	2 G-23	132-1016A	1	9	18.236	0.019
L-25677	2 G-23	132-1016A	0	10	18.236	0.019
L-25677	2 G-23	132-1016A	1	11	18.236	0.019
L-25677	2 G-23	132-1016A	0	12	18.236	0.019
L-25677	2 G-23	132-1016A	1	13	18.236	0.019
L-25677	2 G-23	132-1016A	0	14	18.236	0.019
L-25677	2 G-23	132-1016A	1	15	18.236	0.019
L-25677	2 G-23	132-1016A	0	16	18.236	0.019
L-25677	2 G-23	132-1016A	1	17	18.236	0.019
L-25677	2 G-23	132-1016A	0	18	18.236	0.019
L-25677	2 G-23	132-1016A	1	19	18.236	0.019
L-25677	2 G-23	132-1016A	0	20	18.236	0.019
L-25677	2 G-23	132-1016A	1	21	18.236	0.019
L-25678	1 G-22	125-1016B	1	1	-37.17	0.019
L-25678	1 G-22	125-1016B	0	2	-37.17	0.019
L-25678	1 G-22	125-1016B	1	3	-37.17	0.019
L-25678	1 G-22	125-1016B	0	4	-37.17	0.019
L-25678	1 G-22	125-1016B	1	5	-37.17	0.019
L-25678	1 G-22	125-1016B	0	6	-37.17	0.019
L-25678	1 G-22	125-1016B	1	7	-37.17	0.019
L-25678	1 G-22	125-1016B	0	8	-37.17	0.019
L-25678	1 G-22	125-1016B	1	9	-37.17	0.019
L-25678	1 G-22	125-1016B	0	10	-37.17	0.019
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L-25678	1 G-22	125-1016B	0	12	-37.17	0.019
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L-25678	1 G-22	125-1016B	0	14	-37.17	0.019
L-25678	1 G-22	125-1016B	1	15	-37.17	0.019
L-25678	1 G-22	125-1016B	0	16	-37.17	0.019
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L-25678	1 G-22	125-1016B	0	18	-37.17	0.019
L-25678	1 G-22	125-1016B	1	19	-37.17	0.019
L-25678	1 G-22	125-1016B	0	20	-37.17	0.019
L-25678	1 G-22	125-1016B	1	21	-37.17	0.019
L-25678	1 G-22	125-1016B	1	1	-37.17	0.019
L-25678	1 G-22	125-1016B	0	2	-37.17	0.019
L-25678	1 G-22	125-1016B	1	3	-37.17	0.019
L-25678	1 G-22	125-1016B	0	4	-37.17	0.019
L-25678	1 G-22	125-1016B	1	5	-37.17	0.019
L-25678	1 G-22	125-1016B	0	6	-37.17	0.019
L-25678	1 G-22	125-1016B	1	7	-37.17	0.019
L-25678	1 G-22	125-1016B	0	8	-37.17	0.019
L-25678	1 G-22	125-1016B	1	9	-37.17	0.019
L-25678	1 G-22	125-1016B	0	10	-37.17	0.019
L-25678	1 G-22	125-1016B	1	11	-37.17	0.019
L-25678	1 G-22	125-1016B	0	12	-37.17	0.019
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L-25678	1 G-22	125-1016B	0	14	-37.17	0.019
L-25678	1 G-22	125-1016B	1	15	-37.17	0.019
L-25678	1 G-22	125-1016B	0	16	-37.17	0.019
L-25678	1 G-22	125-1016B	1	17	-37.17	0.019
L-25678	1 G-22	125-1016B	0	18	-37.17	0.019
L-25678	1 G-22	125-1016B	1	19	-37.17	0.019
L-25678	1 G-22	125-1016B	0	20	-37.17	0.019
L-25678	1 G-22	125-1016B	1	21	-37.17	0.019
L-25679	2 G-22	125-1016B	1	1	-37.172	0.021
L-25679	2 G-22	125-1016B	0	2	-37.172	0.021
L-25679	2 G-22	125-1016B	1	3	-37.172	0.021
L-25679	2 G-22	125-1016B	0	4	-37.172	0.021
L-25679	2 G-22	125-1016B	1	5	-37.172	0.021
L-25679	2 G-22	125-1016B	0	6	-37.172	0.021
L-25679	2 G-22	125-1016B	1	7	-37.172	0.021
L-25679	2 G-22	125-1016B	0	8	-37.172	0.021
L-25679	2 G-22	125-1016B	1	9	-37.172	0.021
L-25679	2 G-22	125-1016B	0	10	-37.172	0.021
L-25679	2 G-22	125-1016B	1	11	-37.172	0.021
L-25679	2 G-22	125-1016B	0	12	-37.172	0.021
L-25679	2 G-22	125-1016B	1	13	-37.172	0.021
L-25679	2 G-22	125-1016B	0	14	-37.172	0.021
L-25679	2 G-22	125-1016B	1	15	-37.172	0.021
L-25679	2 G-22	125-1016B	0	16	-37.172	0.021
L-25679	2 G-22	125-1016B	1	17	-37.172	0.021
L-25679	2 G-22	125-1016B	0	18	-37.172	0.021
L-25679	2 G-22	125-1016B	1	19	-37.172	0.021
L-25679	2 G-22	125-1016B	0	20	-37.172	0.021
L-25679	2 G-22	125-1016B	1	21	-37.172	0.021
L-25679	2 G-22	125-1016B	1	1	-37.172	0.021
L-25679	2 G-22	125-1016B	0	2	-37.172	0.021
L-25679	2 G-22	125-1016B	1	3	-37.172	0.021
L-25679	2 G-22	125-1016B	0	4	-37.172	0.021
L-25679	2 G-22	125-1016B	1	5	-37.172	0.021
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L-25679	2 G-22	125-1016B	1	7	-37.172	0.021
L-25679	2 G-22	125-1016B	0	8	-37.172	0.021
L-25679	2 G-22	125-1016B	1	9	-37.172	0.021
L-25679	2 G-22	125-1016B	0	10	-37.172	0.021
L-25679	2 G-22	125-1016B	1	11	-37.172	0.021
L-25679	2 G-22	125-1016B	0	12	-37.172	0.021
L-25679	2 G-22	125-1016B	1	13	-37.172	0.021
L-25679	2 G-22	125-1016B	0	14	-37.172	0.021
L-25679	2 G-22	125-1016B	1	15	-37.172	0.021
L-25679	2 G-22	125-1016B	0	16	-37.172	0.021
L-25679	2 G-22	125-1016B	1	17	-37.172	0.021
L-25679	2 G-22	125-1016B	0	18	-37.172	0.021
L-25679	2 G-22	125-1016B	1	19	-37.172	0.021
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L-25679	2 G-22	125-1016B	1	21	-37.172	0.021
L-25680	1 G-23	132-1016B	1	1	18.969	0.014
L-25680	1 G-23	132-1016B	0	2	18.969	0.014
L-25680	1 G-23	132-1016B	1	3	18.969	0.014
L-25680	1 G-23	132-1016B	0	4	18.969	0.014
L-25680	1 G-23	132-1016B	1	5	18.969	0.014
L-25680	1 G-23	132-1016B	0	6	18.969	0.014
L-25680	1 G-23	132-1016B	1	7	18.969	0.014
L-25680	1 G-23	132-1016B	0	8	18.969	0.014
L-25680	1 G-23	132-1016B	1	9	18.969	0.014
L-25680	1 G-23	132-1016B	0	10	18.969	0.014
L-25680	1 G-23	132-1016B	1	11	18.969	0.014
L-25680	1 G-23	132-1016B	0	12	18.969	0.014
L-25680	1 G-23	132-1016B	1	13	18.969	0.014
L-25680	1 G-23	132-1016B	0	14	18.969	0.014
L-25680	1 G-23	132-1016B	1	15	18.969	0.014
L-25680	1 G-23	132-1016B	0	16	18.969	0.014
L-25680	1 G-23	132-1016B	1	17	18.969	0.014
L-25680	1 G-23	132-1016B	0	18	18.969	0.014
L-25680	1 G-23	132-1016B	1	19	18.969	0.014
L-25680	1 G-23	132-1016B	0	20	18.969	0.014
L-25680	1 G-23	132-1016B	1	21	18.969	0.014
L-25680	1 G-23	132-1016B	1	1	18.969	0.014
L-25680	1 G-23	132-1016B	0	2	18.969	0.014
L-25680	1 G-23	132-1016B	1	3	18.969	0.014
L-25680	1 G-23	132-1016B	0	4	18.969	0.014
L-25680	1 G-23	132-1016B	1	5	18.969	0.014
L-25680	1 G-23	132-1016B	0	6	18.969	0.014
L-25680	1 G-23	132-1016B	1	7	18.969	0.014
L-25680	1 G-23	132-1016B	0	8	18.969	0.014
L-25680	1 G-23	132-1016B	1	9	18.969	0.014
L-25680	1 G-23	132-1016B	0	10	18.969	0.014
L-25680	1 G-23	132-1016B	1	11	18.969	0.014
L-25680	1 G-23	132-1016B	0	12	18.969	0.014
L-25680	1 G-23	132-1016B	1	13	18.969	0.014
L-25680	1 G-23	132-1016B	0	14	18.969	0.014
L-25680	1 G-23	132-1016B	1	15	18.969	0.014
L-25680	1 G-23	132-1016B	0	16	18.969	0.014

L-25680	1	G-23	132-1016B		1	17	18.969	0.014
L-25680	1	G-23	132-1016B		0	18	18.969	0.014
L-25680	1	G-23	132-1016B		1	19	18.969	0.014
L-25680	1	G-23	132-1016B		0	20	18.969	0.014
L-25680	1	G-23	132-1016B		1	21	18.969	0.014
L-25681	2	G-23	132-1016B		1	1	18.969	0.021
L-25681	2	G-23	132-1016B		0	2	18.969	0.021
L-25681	2	G-23	132-1016B		1	3	18.969	0.021
L-25681	2	G-23	132-1016B		0	4	18.969	0.021
L-25681	2	G-23	132-1016B		1	5	18.969	0.021
L-25681	2	G-23	132-1016B		0	6	18.969	0.021
L-25681	2	G-23	132-1016B		1	7	18.969	0.021
L-25681	2	G-23	132-1016B		0	8	18.969	0.021
L-25681	2	G-23	132-1016B		1	9	18.969	0.021
L-25681	2	G-23	132-1016B		0	10	18.969	0.021
L-25681	2	G-23	132-1016B		1	11	18.969	0.021
L-25681	2	G-23	132-1016B		0	12	18.969	0.021
L-25681	2	G-23	132-1016B		1	13	18.969	0.021
L-25681	2	G-23	132-1016B		0	14	18.969	0.021
L-25681	2	G-23	132-1016B		1	15	18.969	0.021
L-25681	2	G-23	132-1016B		0	16	18.969	0.021
L-25681	2	G-23	132-1016B		1	17	18.969	0.021
L-25681	2	G-23	132-1016B		0	18	18.969	0.021
L-25681	2	G-23	132-1016B		1	19	18.969	0.021
L-25681	2	G-23	132-1016B		0	20	18.969	0.021
L-25681	2	G-23	132-1016B		1	21	18.969	0.021
L-25681	2	G-23	132-1016B		1	1	18.969	0.021
L-25681	2	G-23	132-1016B		0	2	18.969	0.021
L-25681	2	G-23	132-1016B		1	3	18.969	0.021
L-25681	2	G-23	132-1016B		0	4	18.969	0.021
L-25681	2	G-23	132-1016B		1	5	18.969	0.021
L-25681	2	G-23	132-1016B		0	6	18.969	0.021
L-25681	2	G-23	132-1016B		1	7	18.969	0.021
L-25681	2	G-23	132-1016B		0	8	18.969	0.021
L-25681	2	G-23	132-1016B		1	9	18.969	0.021
L-25681	2	G-23	132-1016B		0	10	18.969	0.021
L-25681	2	G-23	132-1016B		1	11	18.969	0.021
L-25681	2	G-23	132-1016B		0	12	18.969	0.021
L-25681	2	G-23	132-1016B		1	13	18.969	0.021
L-25681	2	G-23	132-1016B		0	14	18.969	0.021
L-25681	2	G-23	132-1016B		1	15	18.969	0.021
L-25681	2	G-23	132-1016B		0	16	18.969	0.021
L-25681	2	G-23	132-1016B		1	17	18.969	0.021
L-25681	2	G-23	132-1016B		0	18	18.969	0.021
L-25681	2	G-23	132-1016B		1	19	18.969	0.021
L-25681	2	G-23	132-1016B		0	20	18.969	0.021
L-25681	2	G-23	132-1016B		1	21	18.969	0.021
L-25682	1	G-2737	1703b	full Abe	1	1	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	2	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	3	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	4	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	5	-34.699	0.021

L-25682	1	G-2737	1703b	full Abe	0	6	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	7	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	8	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	9	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	10	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	11	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	12	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	13	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	14	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	15	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	16	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	17	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	18	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	19	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	0	20	-34.699	0.021
L-25682	1	G-2737	1703b	full Abe	1	21	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	1	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	2	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	3	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	4	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	5	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	6	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	7	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	8	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	9	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	10	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	11	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	12	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	13	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	14	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	15	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	16	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	17	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	18	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	19	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	0	20	-34.699	0.021
L-25682	1	G-2937	1703b	full Abe	1	21	-34.699	0.021
L-25683	2	G-2737	1703b	full Abe	1	1	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	2	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	3	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	4	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	5	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	6	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	7	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	8	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	9	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	10	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	11	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	12	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	13	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	14	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	15	-34.694	0.019

L-25683	2	G-2737	1703b	full Abe	0	16	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	17	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	18	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	19	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	0	20	-34.694	0.019
L-25683	2	G-2737	1703b	full Abe	1	21	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	1	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	2	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	3	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	4	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	5	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	6	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	7	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	8	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	9	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	10	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	11	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	12	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	13	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	14	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	15	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	16	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	17	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	18	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	19	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	0	20	-34.694	0.019
L-25683	2	G-2937	1703b	full Abe	1	21	-34.694	0.019
L-25684	1	G-2737	1703a	SPE	1	1	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	2	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	3	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	4	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	5	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	6	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	7	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	8	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	9	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	10	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	11	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	12	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	13	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	14	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	15	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	16	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	17	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	18	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	19	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	0	20	-31.341	0.024
L-25684	1	G-2737	1703a	SPE	1	21	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	1	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	2	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	3	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	4	-31.341	0.024

L-25684	1	G-2937	1703a	SPE	1	5	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	6	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	7	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	8	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	9	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	10	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	11	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	12	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	13	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	14	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	15	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	16	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	17	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	18	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	19	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	0	20	-31.341	0.024
L-25684	1	G-2937	1703a	SPE	1	21	-31.341	0.024
L-25685	2	G-2737	1703a	SPE	1	1	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	2	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	3	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	4	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	5	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	6	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	7	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	8	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	9	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	10	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	11	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	12	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	13	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	14	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	15	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	16	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	17	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	18	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	19	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	0	20	-31.3	0.015
L-25685	2	G-2737	1703a	SPE	1	21	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	1	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	2	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	3	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	4	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	5	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	6	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	7	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	8	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	9	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	10	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	11	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	12	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	13	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	14	-31.3	0.015

L-25685	2	G-2937	1703a	SPE	1	15	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	16	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	17	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	18	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	19	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	0	20	-31.3	0.015
L-25685	2	G-2937	1703a	SPE	1	21	-31.3	0.015

d 18O/16O	d 17O/16O	d 17O/16O	d 17O/16O	Area All	Area 32	Area 33	Area 34	Ampl 32
0	-19.496	0.017	0					
-37.241	-19.496	0.017	-19.526					
0	-19.496	0.017	0					
-37.28	-19.496	0.017	-19.553					
0	-19.496	0.017	0					
-37.369	-19.496	0.017	-19.493					
0	-19.496	0.017	0					
-37.264	-19.496	0.017	-19.389					
0	-19.496	0.017	0					
-37.319	-19.496	0.017	-19.355					
0	-19.496	0.017	0					
-37.248	-19.496	0.017	-19.49					
0	-19.496	0.017	0					
-37.256	-19.496	0.017	-19.495					
0	-19.496	0.017	0					
-37.267	-19.496	0.017	-19.495					
0	-19.496	0.017	0					
-37.251	-19.496	0.017	-19.476					
0	-19.496	0.017	0					
-37.296	-19.496	0.017	-19.35					
0	-19.496	0.017	0					
0	-19.478	0.064	0					
-37.251	-19.478	0.064	-19.328					
0	-19.478	0.064	0					
-37.342	-19.478	0.064	-19.582					
0	-19.478	0.064	0					
-37.281	-19.478	0.064	-19.388					
0	-19.478	0.064	0					
-37.239	-19.478	0.064	-19.448					
0	-19.478	0.064	0					
-37.289	-19.478	0.064	-19.485					
0	-19.478	0.064	0					
-37.264	-19.478	0.064	-19.447					
0	-19.478	0.064	0					
-37.266	-19.478	0.064	-19.494					
0	-19.478	0.064	0					
-37.278	-19.478	0.064	-19.431					
0	-19.478	0.064	0					
-37.294	-19.478	0.064	-19.672					
0	-19.478	0.064	0					
-37.304	-19.478	0.064	-19.552					
0	-19.478	0.064	0					
0	71.408	0.029	0					
18.116	71.408	0.029	71.471					
0	71.408	0.029	0					
18.078	71.408	0.029	71.438					
0	71.408	0.029	0					
18.128	71.408	0.029	71.387					
0	71.408	0.029	0					
18.161	71.408	0.029	71.431					
0	71.408	0.029	0					

18.096	71.408	0.029	71.417
0	71.408	0.029	0
18.124	71.408	0.029	71.367
0	71.408	0.029	0
18.131	71.408	0.029	71.437
0	71.408	0.029	0
18.122	71.408	0.029	71.382
0	71.408	0.029	0
18.073	71.408	0.029	71.259
0	71.408	0.029	0
18.119	71.408	0.029	71.474
0	71.408	0.029	0
0	71.454	0.056	0
18.161	71.454	0.056	71.539
0	71.454	0.056	0
18.147	71.454	0.056	71.491
0	71.454	0.056	0
18.165	71.454	0.056	71.503
0	71.454	0.056	0
18.147	71.454	0.056	71.41
0	71.454	0.056	0
18.201	71.454	0.056	71.533
0	71.454	0.056	0
18.102	71.454	0.056	71.443
0	71.454	0.056	0
18.141	71.454	0.056	71.384
0	71.454	0.056	0
18.138	71.454	0.056	71.272
0	71.454	0.056	0
18.161	71.454	0.056	71.412
0	71.454	0.056	0
18.089	71.454	0.056	71.541
0	71.454	0.056	0
0	71.399	0.039	0
18.144	71.399	0.039	71.457
0	71.399	0.039	0
18.17	71.399	0.039	71.54
0	71.399	0.039	0
18.065	71.399	0.039	71.365
0	71.399	0.039	0
18.137	71.399	0.039	71.422
0	71.399	0.039	0
18.193	71.399	0.039	71.313
0	71.399	0.039	0
18.187	71.399	0.039	71.344
0	71.399	0.039	0
18.119	71.399	0.039	71.559
0	71.399	0.039	0
18.107	71.399	0.039	71.432
0	71.399	0.039	0
18.184	71.399	0.039	71.391
0	71.399	0.039	0

18.107	71.399	0.039	71.385
0	71.399	0.039	0
0	71.398	0.029	0
18.181	71.398	0.029	71.402
0	71.398	0.029	0
18.172	71.398	0.029	71.547
0	71.398	0.029	0
18.149	71.398	0.029	71.58
0	71.398	0.029	0
18.107	71.398	0.029	71.381
0	71.398	0.029	0
18.191	71.398	0.029	71.311
0	71.398	0.029	0
18.198	71.398	0.029	71.431
0	71.398	0.029	0
18.118	71.398	0.029	71.382
0	71.398	0.029	0
18.11	71.398	0.029	71.432
0	71.398	0.029	0
18.154	71.398	0.029	71.362
0	71.398	0.029	0
18.161	71.398	0.029	71.299
0	71.398	0.029	0
0	71.401	0.024	0
18.212	71.401	0.024	71.441
0	71.401	0.024	0
18.198	71.401	0.024	71.392
0	71.401	0.024	0
18.197	71.401	0.024	71.427
0	71.401	0.024	0
18.233	71.401	0.024	71.349
0	71.401	0.024	0
18.18	71.401	0.024	71.394
0	71.401	0.024	0
18.242	71.401	0.024	71.502
0	71.401	0.024	0
18.229	71.401	0.024	71.393
0	71.401	0.024	0
18.198	71.401	0.024	71.384
0	71.401	0.024	0
18.194	71.401	0.024	71.376
0	71.401	0.024	0
18.195	71.401	0.024	71.339
0	71.401	0.024	0
0	71.401	0.024	0
18.212	71.401	0.024	71.441
0	71.401	0.024	0
18.198	71.401	0.024	71.392
0	71.401	0.024	0
18.197	71.401	0.024	71.427
0	71.401	0.024	0
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0	71.401	0.024	0
18.18	71.401	0.024	71.394
0	71.401	0.024	0
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0	71.401	0.024	0
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0	71.401	0.024	0
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0	71.401	0.024	0
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0	71.401	0.024	0
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18.157	71.508	0.057	71.519
0	71.508	0.057	0
18.203	71.508	0.057	71.536
0	71.508	0.057	0
18.209	71.508	0.057	71.328
0	71.508	0.057	0
18.174	71.508	0.057	71.419
0	71.508	0.057	0
18.27	71.508	0.057	71.56
0	71.508	0.057	0
18.262	71.508	0.057	71.592
0	71.508	0.057	0
18.244	71.508	0.057	71.518
0	71.508	0.057	0
18.183	71.508	0.057	71.393
0	71.508	0.057	0
18.23	71.508	0.057	71.439
0	71.508	0.057	0
18.175	71.508	0.057	71.566
0	71.508	0.057	0
0	71.508	0.057	0
18.157	71.508	0.057	71.519
0	71.508	0.057	0
18.203	71.508	0.057	71.536
0	71.508	0.057	0
18.209	71.508	0.057	71.328
0	71.508	0.057	0
18.174	71.508	0.057	71.419
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0	71.508	0.057	0
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0	71.508	0.057	0
18.183	71.508	0.057	71.393
0	71.508	0.057	0
18.23	71.508	0.057	71.439

0	71.508	0.057	0
18.175	71.508	0.057	71.566
0	71.508	0.057	0
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18.225	71.458	0.037	71.481
0	71.458	0.037	0
18.268	71.458	0.037	71.582
0	71.458	0.037	0
18.271	71.458	0.037	71.444
0	71.458	0.037	0
18.287	71.458	0.037	71.466
0	71.458	0.037	0
18.216	71.458	0.037	71.458
0	71.458	0.037	0
18.168	71.458	0.037	71.672
0	71.458	0.037	0
18.271	71.458	0.037	71.413
0	71.458	0.037	0
18.232	71.458	0.037	71.533
0	71.458	0.037	0
18.287	71.458	0.037	71.424
0	71.458	0.037	0
18.264	71.458	0.037	71.449
0	71.458	0.037	0
0	71.458	0.037	0
18.225	71.458	0.037	71.481
0	71.458	0.037	0
18.268	71.458	0.037	71.582
0	71.458	0.037	0
18.271	71.458	0.037	71.444
0	71.458	0.037	0
18.287	71.458	0.037	71.466
0	71.458	0.037	0
18.216	71.458	0.037	71.458
0	71.458	0.037	0
18.168	71.458	0.037	71.672
0	71.458	0.037	0
18.271	71.458	0.037	71.413
0	71.458	0.037	0
18.232	71.458	0.037	71.533
0	71.458	0.037	0
18.287	71.458	0.037	71.424
0	71.458	0.037	0
18.264	71.458	0.037	71.449
0	71.458	0.037	0
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18.248	71.409	0.03	71.339
0	71.409	0.03	0
18.252	71.409	0.03	71.374
0	71.409	0.03	0
18.264	71.409	0.03	71.516
0	71.409	0.03	0

18.206	71.409	0.03	71.385
0	71.409	0.03	0
18.257	71.409	0.03	71.38
0	71.409	0.03	0
18.16	71.409	0.03	71.443
0	71.409	0.03	0
18.242	71.409	0.03	71.416
0	71.409	0.03	0
18.249	71.409	0.03	71.416
0	71.409	0.03	0
18.216	71.409	0.03	71.403
0	71.409	0.03	0
18.22	71.409	0.03	71.457
0	71.409	0.03	0
0	71.409	0.03	0
18.248	71.409	0.03	71.339
0	71.409	0.03	0
18.252	71.409	0.03	71.374
0	71.409	0.03	0
18.264	71.409	0.03	71.516
0	71.409	0.03	0
18.206	71.409	0.03	71.385
0	71.409	0.03	0
18.257	71.409	0.03	71.38
0	71.409	0.03	0
18.16	71.409	0.03	71.443
0	71.409	0.03	0
18.242	71.409	0.03	71.416
0	71.409	0.03	0
18.249	71.409	0.03	71.416
0	71.409	0.03	0
18.216	71.409	0.03	71.403
0	71.409	0.03	0
18.22	71.409	0.03	71.457
0	71.409	0.03	0
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0	-19.47	0.042	0
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0	-19.47	0.042	0
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0	-19.47	0.042	0
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0	-19.47	0.042	0
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0	-19.47	0.042	0
0	-19.434	0.027	0
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0	-19.434	0.027	0
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0	-19.434	0.027	0
-37.185	-19.434	0.027	-19.583
0	-19.434	0.027	0
-37.138	-19.434	0.027	-19.431
0	-19.434	0.027	0
-37.2	-19.434	0.027	-19.428
0	-19.434	0.027	0
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-37.205	-19.434	0.027	-19.392
0	-19.434	0.027	0
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0	-19.434	0.027	0
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0	-19.434	0.027	0
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0	-19.434	0.027	0
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0	72.476	0.043	0
18.971	72.476	0.043	72.463
0	72.476	0.043	0
18.945	72.476	0.043	72.489
0	72.476	0.043	0
18.919	72.476	0.043	72.469
0	72.476	0.043	0
18.957	72.476	0.043	72.459
0	72.476	0.043	0
18.923	72.476	0.043	72.345
0	72.476	0.043	0
18.975	72.476	0.043	72.593
0	72.476	0.043	0
18.968	72.476	0.043	72.448
0	72.476	0.043	0
18.988	72.476	0.043	72.409
0	72.476	0.043	0
19.006	72.476	0.043	72.531
0	72.476	0.043	0
18.981	72.476	0.043	72.538
0	72.476	0.043	0
0	72.476	0.043	0
18.971	72.476	0.043	72.463
0	72.476	0.043	0
18.945	72.476	0.043	72.489
0	72.476	0.043	0
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0	72.476	0.043	0
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0	72.476	0.043	0
18.923	72.476	0.043	72.345
0	72.476	0.043	0
18.975	72.476	0.043	72.593
0	72.476	0.043	0
18.968	72.476	0.043	72.448
0	72.476	0.043	0
18.988	72.476	0.043	72.409

0	72.476	0.043	0
19.006	72.476	0.043	72.531
0	72.476	0.043	0
18.981	72.476	0.043	72.538
0	72.476	0.043	0
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19.026	72.563	0.046	72.641
0	72.563	0.046	0
18.986	72.563	0.046	72.419
0	72.563	0.046	0
18.94	72.563	0.046	72.647
0	72.563	0.046	0
18.974	72.563	0.046	72.541
0	72.563	0.046	0
18.962	72.563	0.046	72.614
0	72.563	0.046	0
18.91	72.563	0.046	72.46
0	72.563	0.046	0
18.984	72.563	0.046	72.608
0	72.563	0.046	0
19.041	72.563	0.046	72.51
0	72.563	0.046	0
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0	72.563	0.046	0
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0	72.563	0.046	0
0	72.563	0.046	0
19.026	72.563	0.046	72.641
0	72.563	0.046	0
18.986	72.563	0.046	72.419
0	72.563	0.046	0
18.94	72.563	0.046	72.647
0	72.563	0.046	0
18.974	72.563	0.046	72.541
0	72.563	0.046	0
18.962	72.563	0.046	72.614
0	72.563	0.046	0
18.91	72.563	0.046	72.46
0	72.563	0.046	0
18.984	72.563	0.046	72.608
0	72.563	0.046	0
19.041	72.563	0.046	72.51
0	72.563	0.046	0
18.992	72.563	0.046	72.462
0	72.563	0.046	0
18.943	72.563	0.046	72.54
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0	-12.912	0.032	0
-31.349	-12.912	0.032	-12.932
0	-12.912	0.032	0
-31.313	-12.912	0.032	-12.987
0	-12.912	0.032	0
-31.312	-12.912	0.032	-13.016
0	-12.912	0.032	0
-31.305	-12.912	0.032	-13.001
0	-12.912	0.032	0
-31.248	-12.912	0.032	-12.873
0	-12.912	0.032	0
-31.253	-12.912	0.032	-12.887
0	-12.912	0.032	0
-31.282	-12.912	0.032	-12.958
0	-12.912	0.032	0
-31.279	-12.912	0.032	-12.871
0	-12.912	0.032	0
-31.307	-12.912	0.032	-12.899
0	-12.912	0.032	0
-31.359	-12.912	0.032	-12.884
0	-12.912	0.032	0
0	-12.912	0.032	0
-31.349	-12.912	0.032	-12.932
0	-12.912	0.032	0
-31.313	-12.912	0.032	-12.987
0	-12.912	0.032	0
-31.312	-12.912	0.032	-13.016
0	-12.912	0.032	0
-31.305	-12.912	0.032	-13.001
0	-12.912	0.032	0
-31.248	-12.912	0.032	-12.873
0	-12.912	0.032	0
-31.253	-12.912	0.032	-12.887
0	-12.912	0.032	0
-31.282	-12.912	0.032	-12.958

0	-12.912	0.032	0
-31.279	-12.912	0.032	-12.871
0	-12.912	0.032	0
-31.307	-12.912	0.032	-12.899
0	-12.912	0.032	0
-31.359	-12.912	0.032	-12.884
0	-12.912	0.032	0

Ampl 33	Ampl 34	rIntensity 3	rIntensity 3	rIntensity 3	Gasconfigu	Magnet Va	Molecule F	Outliertest
		7905	601	3291	O2	8763	O2	Sigma
		7889	588	3162	O2	8763	O2	Sigma
		7905	601	3291	O2	8763	O2	Sigma
		7874	587	3156	O2	8763	O2	Sigma
		7900	601	3289	O2	8763	O2	Sigma
		7871	587	3154	O2	8763	O2	Sigma
		7898	601	3288	O2	8763	O2	Sigma
		7848	585	3146	O2	8763	O2	Sigma
		7882	599	3282	O2	8763	O2	Sigma
		7823	583	3136	O2	8763	O2	Sigma
		7872	599	3277	O2	8763	O2	Sigma
		7804	582	3128	O2	8763	O2	Sigma
		7866	598	3275	O2	8763	O2	Sigma
		7783	580	3120	O2	8763	O2	Sigma
		7859	598	3272	O2	8763	O2	Sigma
		7769	579	3114	O2	8763	O2	Sigma
		7856	597	3271	O2	8763	O2	Sigma
		7752	578	3108	O2	8763	O2	Sigma
		7845	597	3267	O2	8763	O2	Sigma
		7734	577	3100	O2	8763	O2	Sigma
		7839	596	3264	O2	8763	O2	Sigma
		7940	604	3305	O2	8763	O2	Sigma
		7893	589	3164	O2	8763	O2	Sigma
		7931	603	3302	O2	8763	O2	Sigma
		7877	587	3157	O2	8763	O2	Sigma
		7923	603	3299	O2	8763	O2	Sigma
		7852	586	3148	O2	8763	O2	Sigma
		7910	601	3294	O2	8763	O2	Sigma
		7825	583	3137	O2	8763	O2	Sigma
		7903	601	3290	O2	8763	O2	Sigma
		7815	583	3133	O2	8763	O2	Sigma
		7886	600	3284	O2	8763	O2	Sigma
		7787	581	3122	O2	8763	O2	Sigma
		7877	599	3280	O2	8763	O2	Sigma
		7768	579	3114	O2	8763	O2	Sigma
		7869	598	3277	O2	8763	O2	Sigma
		7749	578	3106	O2	8763	O2	Sigma
		7861	598	3273	O2	8763	O2	Sigma
		7731	576	3099	O2	8763	O2	Sigma
		7853	597	3270	O2	8763	O2	Sigma
		7717	576	3094	O2	8763	O2	Sigma
		7850	597	3269	O2	8763	O2	Sigma
		7946	604	3307	O2	8763	O2	Sigma
		7849	639	3326	O2	8763	O2	Sigma
		7941	604	3306	O2	8763	O2	Sigma
		7840	639	3323	O2	8763	O2	Sigma
		7933	603	3302	O2	8763	O2	Sigma
		7813	636	3311	O2	8763	O2	Sigma
		7922	602	3298	O2	8763	O2	Sigma
		7788	634	3301	O2	8763	O2	Sigma
		7907	601	3292	O2	8763	O2	Sigma

7771	633	3294 O2	8763	O2	Sigma
7902	601	3290 O2	8763	O2	Sigma
7752	632	3286 O2	8763	O2	Sigma
7900	601	3289 O2	8763	O2	Sigma
7736	630	3279 O2	8763	O2	Sigma
7890	600	3285 O2	8763	O2	Sigma
7719	629	3272 O2	8763	O2	Sigma
7881	599	3281 O2	8763	O2	Sigma
7701	627	3265 O2	8763	O2	Sigma
7881	599	3282 O2	8763	O2	Sigma
7684	626	3258 O2	8763	O2	Sigma
7866	598	3275 O2	8763	O2	Sigma
7906	601	3292 O2	8763	O2	Sigma
7866	641	3335 O2	8763	O2	Sigma
7899	601	3289 O2	8763	O2	Sigma
7842	639	3325 O2	8763	O2	Sigma
7884	600	3283 O2	8763	O2	Sigma
7825	638	3318 O2	8763	O2	Sigma
7878	599	3280 O2	8763	O2	Sigma
7805	636	3309 O2	8763	O2	Sigma
7871	599	3277 O2	8763	O2	Sigma
7780	634	3299 O2	8763	O2	Sigma
7860	598	3273 O2	8763	O2	Sigma
7768	633	3293 O2	8763	O2	Sigma
7851	597	3269 O2	8763	O2	Sigma
7745	631	3284 O2	8763	O2	Sigma
7848	597	3268 O2	8763	O2	Sigma
7722	629	3274 O2	8763	O2	Sigma
7845	597	3267 O2	8763	O2	Sigma
7707	628	3268 O2	8763	O2	Sigma
7829	596	3260 O2	8763	O2	Sigma
7692	627	3261 O2	8763	O2	Sigma
7822	595	3257 O2	8763	O2	Sigma
7947	604	3309 O2	8763	O2	Sigma
7808	636	3310 O2	8763	O2	Sigma
7935	604	3304 O2	8763	O2	Sigma
7779	634	3298 O2	8763	O2	Sigma
7923	603	3299 O2	8763	O2	Sigma
7767	633	3293 O2	8763	O2	Sigma
7919	602	3298 O2	8763	O2	Sigma
7738	631	3281 O2	8763	O2	Sigma
7902	601	3291 O2	8763	O2	Sigma
7713	629	3270 O2	8763	O2	Sigma
7899	601	3289 O2	8763	O2	Sigma
7694	627	3262 O2	8763	O2	Sigma
7890	600	3286 O2	8763	O2	Sigma
7671	625	3252 O2	8763	O2	Sigma
7882	600	3282 O2	8763	O2	Sigma
7653	624	3245 O2	8763	O2	Sigma
7863	598	3275 O2	8763	O2	Sigma
7627	622	3234 O2	8763	O2	Sigma
7858	598	3273 O2	8763	O2	Sigma

7622	621	3231 O2	8763	O2	Sigma
7855	598	3271 O2	8763	O2	Sigma
7888	600	3285 O2	8763	O2	Sigma
7854	640	3330 O2	8763	O2	Sigma
7890	600	3286 O2	8763	O2	Sigma
7836	639	3322 O2	8763	O2	Sigma
7878	599	3281 O2	8763	O2	Sigma
7811	637	3312 O2	8763	O2	Sigma
7865	598	3275 O2	8763	O2	Sigma
7788	635	3302 O2	8763	O2	Sigma
7866	598	3276 O2	8763	O2	Sigma
7779	634	3298 O2	8763	O2	Sigma
7864	598	3274 O2	8763	O2	Sigma
7739	631	3281 O2	8763	O2	Sigma
7843	597	3266 O2	8763	O2	Sigma
7721	629	3274 O2	8763	O2	Sigma
7826	595	3259 O2	8763	O2	Sigma
7701	628	3265 O2	8763	O2	Sigma
7815	595	3255 O2	8763	O2	Sigma
7676	626	3255 O2	8763	O2	Sigma
7813	594	3254 O2	8763	O2	Sigma
7660	624	3248 O2	8763	O2	Sigma
7806	594	3251 O2	8763	O2	Sigma
7949	604	3305 O2	8763	O2	Sigma
7884	642	3337 O2	8763	O2	Sigma
7940	604	3301 O2	8763	O2	Sigma
7865	641	3329 O2	8763	O2	Sigma
7934	603	3298 O2	8763	O2	Sigma
7850	639	3322 O2	8763	O2	Sigma
7932	603	3297 O2	8763	O2	Sigma
7828	637	3313 O2	8763	O2	Sigma
7921	602	3293 O2	8763	O2	Sigma
7799	635	3301 O2	8763	O2	Sigma
7908	601	3287 O2	8763	O2	Sigma
7770	633	3289 O2	8763	O2	Sigma
7909	601	3287 O2	8763	O2	Sigma
7756	632	3283 O2	8763	O2	Sigma
7898	600	3283 O2	8763	O2	Sigma
7733	630	3273 O2	8763	O2	Sigma
7886	599	3278 O2	8763	O2	Sigma
7706	628	3262 O2	8763	O2	Sigma
7884	599	3277 O2	8763	O2	Sigma
7688	626	3254 O2	8763	O2	Sigma
7880	599	3276 O2	8763	O2	Sigma
7949	604	3305 O2	8763	O2	Sigma
7884	642	3337 O2	8763	O2	Sigma
7940	604	3301 O2	8763	O2	Sigma
7865	641	3329 O2	8763	O2	Sigma
7934	603	3298 O2	8763	O2	Sigma
7850	639	3322 O2	8763	O2	Sigma
7932	603	3297 O2	8763	O2	Sigma
7828	637	3313 O2	8763	O2	Sigma

7921	602	3293 O2	8763	O2	Sigma
7799	635	3301 O2	8763	O2	Sigma
7908	601	3287 O2	8763	O2	Sigma
7770	633	3289 O2	8763	O2	Sigma
7909	601	3287 O2	8763	O2	Sigma
7756	632	3283 O2	8763	O2	Sigma
7898	600	3283 O2	8763	O2	Sigma
7733	630	3273 O2	8763	O2	Sigma
7886	599	3278 O2	8763	O2	Sigma
7706	628	3262 O2	8763	O2	Sigma
7884	599	3277 O2	8763	O2	Sigma
7688	626	3254 O2	8763	O2	Sigma
7880	599	3276 O2	8763	O2	Sigma
7829	595	3254 O2	8763	O2	Sigma
7868	641	3330 O2	8763	O2	Sigma
7819	594	3251 O2	8763	O2	Sigma
7834	638	3316 O2	8763	O2	Sigma
7810	594	3247 O2	8763	O2	Sigma
7812	636	3307 O2	8763	O2	Sigma
7807	593	3245 O2	8763	O2	Sigma
7790	634	3298 O2	8763	O2	Sigma
7796	593	3241 O2	8763	O2	Sigma
7766	633	3287 O2	8763	O2	Sigma
7791	592	3239 O2	8763	O2	Sigma
7744	631	3278 O2	8763	O2	Sigma
7787	592	3237 O2	8763	O2	Sigma
7721	629	3269 O2	8763	O2	Sigma
7767	590	3229 O2	8763	O2	Sigma
7693	627	3257 O2	8763	O2	Sigma
7752	589	3223 O2	8763	O2	Sigma
7654	623	3241 O2	8763	O2	Sigma
7739	588	3218 O2	8763	O2	Sigma
7634	622	3232 O2	8763	O2	Sigma
7728	588	3213 O2	8763	O2	Sigma
7829	595	3254 O2	8763	O2	Sigma
7868	641	3330 O2	8763	O2	Sigma
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7812	636	3307 O2	8763	O2	Sigma
7807	593	3245 O2	8763	O2	Sigma
7790	634	3298 O2	8763	O2	Sigma
7796	593	3241 O2	8763	O2	Sigma
7766	633	3287 O2	8763	O2	Sigma
7791	592	3239 O2	8763	O2	Sigma
7744	631	3278 O2	8763	O2	Sigma
7787	592	3237 O2	8763	O2	Sigma
7721	629	3269 O2	8763	O2	Sigma
7767	590	3229 O2	8763	O2	Sigma
7693	627	3257 O2	8763	O2	Sigma
7752	589	3223 O2	8763	O2	Sigma
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7739	588	3218 O2	8763	O2	Sigma
7634	622	3232 O2	8763	O2	Sigma
7728	588	3213 O2	8763	O2	Sigma
7936	603	3300 O2	8763	O2	Sigma
7846	639	3322 O2	8763	O2	Sigma
7922	602	3294 O2	8763	O2	Sigma
7817	637	3310 O2	8763	O2	Sigma
7901	601	3285 O2	8763	O2	Sigma
7787	634	3297 O2	8763	O2	Sigma
7891	600	3281 O2	8763	O2	Sigma
7762	632	3287 O2	8763	O2	Sigma
7882	599	3278 O2	8763	O2	Sigma
7733	630	3274 O2	8763	O2	Sigma
7872	598	3274 O2	8763	O2	Sigma
7708	628	3264 O2	8763	O2	Sigma
7866	598	3271 O2	8763	O2	Sigma
7683	626	3254 O2	8763	O2	Sigma
7853	597	3266 O2	8763	O2	Sigma
7656	624	3242 O2	8763	O2	Sigma
7846	596	3263 O2	8763	O2	Sigma
7631	622	3231 O2	8763	O2	Sigma
7844	596	3262 O2	8763	O2	Sigma
7611	620	3223 O2	8763	O2	Sigma
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7787	634	3297 O2	8763	O2	Sigma
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7762	632	3287 O2	8763	O2	Sigma
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7733	630	3274 O2	8763	O2	Sigma
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7866	598	3271 O2	8763	O2	Sigma
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7631	622	3231 O2	8763	O2	Sigma
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7881	642	3337 O2	8763	O2	Sigma
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7810	594	3248 O2	8763	O2	Sigma
7829	638	3315 O2	8763	O2	Sigma
7800	593	3244 O2	8763	O2	Sigma

7797	635	3302	O2	8763	O2	Sigma
7790	592	3240	O2	8763	O2	Sigma
7772	633	3291	O2	8763	O2	Sigma
7785	592	3238	O2	8763	O2	Sigma
7748	631	3281	O2	8763	O2	Sigma
7774	591	3233	O2	8763	O2	Sigma
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7767	591	3230	O2	8763	O2	Sigma
7694	627	3258	O2	8763	O2	Sigma
7758	590	3227	O2	8763	O2	Sigma
7671	625	3248	O2	8763	O2	Sigma
7752	589	3224	O2	8763	O2	Sigma
7646	623	3238	O2	8763	O2	Sigma
7741	589	3220	O2	8763	O2	Sigma
7828	595	3255	O2	8763	O2	Sigma
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7821	595	3252	O2	8763	O2	Sigma
7857	640	3327	O2	8763	O2	Sigma
7810	594	3248	O2	8763	O2	Sigma
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7772	633	3291	O2	8763	O2	Sigma
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7867	586	3149	O2	8763	O2	Sigma
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7846	585	3141	O2	8763	O2	Sigma
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7913	601	3290	O2	8763	O2	Sigma
7806	582	3125	O2	8763	O2	Sigma
7904	601	3286	O2	8763	O2	Sigma
7789	580	3118	O2	8763	O2	Sigma
7896	600	3283	O2	8763	O2	Sigma
7770	579	3111	O2	8763	O2	Sigma
7881	599	3277	O2	8763	O2	Sigma
7747	577	3101	O2	8763	O2	Sigma
7873	598	3274	O2	8763	O2	Sigma
7733	576	3096	O2	8763	O2	Sigma
7863	598	3270	O2	8763	O2	Sigma

7712	575	3088 O2	8763	O2	Sigma
7850	597	3264 O2	8763	O2	Sigma
7694	573	3081 O2	8763	O2	Sigma
7841	596	3260 O2	8763	O2	Sigma
7943	603	3302 O2	8763	O2	Sigma
7867	586	3149 O2	8763	O2	Sigma
7929	602	3297 O2	8763	O2	Sigma
7846	585	3141 O2	8763	O2	Sigma
7920	602	3293 O2	8763	O2	Sigma
7823	583	3132 O2	8763	O2	Sigma
7913	601	3290 O2	8763	O2	Sigma
7806	582	3125 O2	8763	O2	Sigma
7904	601	3286 O2	8763	O2	Sigma
7789	580	3118 O2	8763	O2	Sigma
7896	600	3283 O2	8763	O2	Sigma
7770	579	3111 O2	8763	O2	Sigma
7881	599	3277 O2	8763	O2	Sigma
7747	577	3101 O2	8763	O2	Sigma
7873	598	3274 O2	8763	O2	Sigma
7733	576	3096 O2	8763	O2	Sigma
7863	598	3270 O2	8763	O2	Sigma
7712	575	3088 O2	8763	O2	Sigma
7850	597	3264 O2	8763	O2	Sigma
7694	573	3081 O2	8763	O2	Sigma
7841	596	3260 O2	8763	O2	Sigma
7833	595	3257 O2	8763	O2	Sigma
7869	586	3151 O2	8763	O2	Sigma
7825	595	3254 O2	8763	O2	Sigma
7858	586	3146 O2	8763	O2	Sigma
7822	595	3253 O2	8763	O2	Sigma
7830	583	3135 O2	8763	O2	Sigma
7800	593	3243 O2	8763	O2	Sigma
7807	582	3126 O2	8763	O2	Sigma
7792	592	3240 O2	8763	O2	Sigma
7793	581	3120 O2	8763	O2	Sigma
7779	591	3235 O2	8763	O2	Sigma
7771	579	3112 O2	8763	O2	Sigma
7762	590	3228 O2	8763	O2	Sigma
7752	578	3104 O2	8763	O2	Sigma
7767	590	3230 O2	8763	O2	Sigma
7740	577	3099 O2	8763	O2	Sigma
7751	589	3223 O2	8763	O2	Sigma
7716	575	3090 O2	8763	O2	Sigma
7742	589	3220 O2	8763	O2	Sigma
7713	575	3088 O2	8763	O2	Sigma
7747	589	3222 O2	8763	O2	Sigma
7833	595	3257 O2	8763	O2	Sigma
7869	586	3151 O2	8763	O2	Sigma
7825	595	3254 O2	8763	O2	Sigma
7858	586	3146 O2	8763	O2	Sigma
7822	595	3253 O2	8763	O2	Sigma
7830	583	3135 O2	8763	O2	Sigma

7800	593	3243	O2	8763	O2	Sigma
7807	582	3126	O2	8763	O2	Sigma
7792	592	3240	O2	8763	O2	Sigma
7793	581	3120	O2	8763	O2	Sigma
7779	591	3235	O2	8763	O2	Sigma
7771	579	3112	O2	8763	O2	Sigma
7762	590	3228	O2	8763	O2	Sigma
7752	578	3104	O2	8763	O2	Sigma
7767	590	3230	O2	8763	O2	Sigma
7740	577	3099	O2	8763	O2	Sigma
7751	589	3223	O2	8763	O2	Sigma
7716	575	3090	O2	8763	O2	Sigma
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02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:00:45	2016/02/01L-25683__GG_1703b.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf

02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
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02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
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02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
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02/01/16	15:59:28	2016/02/01L-25684__GG_1703a.caf
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02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
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02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf

02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf
02/01/16	16:10:35	2016/02/01L-25685__GG_1703a.caf

Northern California
ACCUTEST
LABORATORIES

04/17/15

Technical Report for

United Technology Corporation

ENSTNM: UTC RFF Superfund Site - Rialto, CA

0888816743

Accutest Job Number: C39344

Sampling Date: 04/08/15

Report to:

Ensafe
5724 Summer Trees Road
Memphis, TN 38134
jteves@ensafe.com; jgable@envstd.com

ATTN: Josh Teves

Total number of pages in report: **16**

NELAP ACCREDITED TNI LABORATORY

James J. Rhudy
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Elvin Kumar 408-588-0200

Certifications: CA (ELAP 2910) AK (UST-092) AZ (AZ0762) NV (CA00150) OR (CA300006) WA (C925) DoD ELAP (L-A-B L2242)

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Accutest Laboratories

Sample Summary

United Technology Corporation

Job No: C39344

ENSTNM: UTC RFF Superfund Site - Rialto, CA
Project No: 0888816743

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
C39344-1	04/08/15	14:40	MB	04/10/15	AQ	Ground Water	5W13B5G280

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	United Technology Corporation	**Job No**	C39344
Site:	ENSTNM: UTC RFF Superfund Site - Rialto, CA	**Report Date**	4/17/2015 3:51:19 PM

1 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were collected on 04/08/2015 and were received at Accutest on 04/10/2015 properly preserved, at 2.7 Deg. C and intact. These Samples received an Accutest job number of C39344. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Wet Chemistry By Method EPA 314

Matrix: AQ **Batch ID:** GP7663

- Sample(s) C39235-1MS, C39235-1MSD were used as the QC samples for Perchlorate.

Wet Chemistry By Method SM2510 B-97

Matrix: AQ **Batch ID:** GN16135

- Sample(s) C39351-3DUP were used as the QC samples for Specific Conductivity.

Accutest Laboratories Northern California (ALNCA) certifies that this report meets the project requirements for analytical data produced for the samples as received at ALNCA and as stated on the COC. ALNCA certifies that the data meets the Data QualityObjectives for precision, accuracy and completeness as specified in the ALNCA Quality Manual except as noted above. This report is to be used in its entirety. ALNCA is not responsible for any assumptions of data quality if partial data packages are used

Summary of Hits

Job Number: C39344
Account: United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA
Collected: 04/08/15

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Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
C39344-1	**5W13B5G280**					
Perchlorate		4.2	1.0	0.31	ug/l	EPA 314
Specific Conductivity		563	1.0	1.0	umhos/cm	SM2510 B-97

Northern California ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	5W13B5G280		
Lab Sample ID:	C39344-1	**Date Sampled:**	04/08/15
Matrix:	AQ - Ground Water	**Date Received:**	04/10/15
		Percent Solids:	n/a
Project:	ENSTNM: UTC RFF Superfund Site - Rialto, CA		

General Chemistry

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Perchlorate by IC								
Perchlorate	4.2	1.0	0.31	ug/l	1	04/11/15 01:19	PH	EPA 314
Specific Conductivity	563	1.0	1.0	umhos/cm	1	04/13/15 12:30	TN	SM2510 B-97

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
J = Indicates a result > = MDL but < RL

Northern California ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

CHAIN OF CUSTODY

ACCUTEST® LABORATORIES
2105 Lundy Ave, San Jose, CA 95131
(408) 588-0200 FAX: (408) 588-0201

FED-EX Tracking # 8034 7911 7550
Bottle Order Control #
Accutest Quote #
Accutest NC Job #: C C39344

Client / Reporting Information

Company Name: Ensafe
Address: 2151 Salvio Street
City: Concord State: Ca Zip: 94520
Project Contact: Josh Torres
Phone #: 925 305 2109
Samplers's Name: M. Barishi

Project Information

Project Name: RFF superfund site
Street:
City: Rialto State: Ca
Project #: 0888816743
EMAIL: Mbarishi@ensafe.com
Client Purchase Order #:

Requested Analysis: Perchlorate E314

Matrix Codes: WW- Wastewater; GW- Ground Water; SW- Surface Water; SO- Soil; OI-Oil; WP-Wipe; LIQ - Non-aqueous Liquid; AIR; DW- Drinking Water (Perchlorate Only)

Accutest Sample ID	Sample ID / Field Point / Point of Collection	Collection Date	Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	NaHSO4	MEOH	EDACORE	Perchlorate E314	LAB USE ONLY
1	SW13B5G-280	4/8	1440	MB	GW	1					1				X	

Turnaround Time (Business days)

Approved By / Date:

- [ ] 10 Day
- [X] 5 Day
- [ ] 3 Day
- [ ] 2 Day
- [ ] 1 Day
- [ ] Same Day

Emergency T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" - Results only
- [ ] Commercial "B" - Results with QC summaries
- [ ] Commerical "B+" - Results, QC, and chromatograms
- [ ] FULT1 - Level 4 data package
- [ ] EDF for Geotracker [ ] EDD Format
- Provide EDF Global ID
- Provide EDF Logcode:

Comments / Remarks

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	4/9/15 1545	1 4-9 1545	2	4-09-15 1830	2 FedEx
Relinquished by: 3 FedEx	Date Time: 10:10 4-10-15	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time: 4/10/15	Received By: 5	Custody Seal # Y	Appropriate Bottle / Pres. Y / N; Labels match Coc? Y / N	Headspace Y / N; Separate Receiving Check List used: Y / N; On Ice (Y) N; Cooler Temp. 2.7 oC

IRVINE

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C39344: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: C39344 **Client:** ENSAFE **Project:** RFF SUPERFUND SITE

Date / Time Received: 4/10/2015 10:10:00 AM **Delivery Method:** FedEx **Airbill #'s:** 803477117550

Cooler Temps (Initial/Adjusted): #1: (2.7/2.7);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	IR1;		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Accutest Laboratories
V:408.588.0200

2105 Lundy Avenue
F: 408.588.0201

San Jose, CA 95131
www/accutest.com

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C39344: Chain of Custody
Page 2 of 2

Northern California ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39344
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Perchlorate	GP7663/GN16126	3.0	0.0	ug/l	25	24.3	97.2	85-115%
Specific Conductivity	GN16135	1.0	0.0	umhos/cm				

Associated Samples:
Batch GP7663: C39344-1
Batch GN16135: C39344-1
(*) Outside of QC limits

BLANK SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39344
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	Units	Spike Amount	BSD Result	RPD	QC Limit
Perchlorate	GP7663/GN16126	ug/l	25	22.6	7.2	

Associated Samples:
Batch GP7663: C39344-1
(*) Outside of QC limits

6.2
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DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39344
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Specific Conductivity	GN16135	C39351-3	umhos/cm	2020	2030	0.5	0-10%

Associated Samples:
Batch GN16135: C39344-1
(*) Outside of QC limits

6.3
6

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39344
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Perchlorate	GP7663/GN16126	C39235-1	ug/l	7.2	25	32.6	101.6	80-120%

Associated Samples:
Batch GP7663: C39344-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

MATRIX SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39344
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MSD Result	RPD	QC Limit
Perchlorate	GP7663/GN16126	C39235-1	ug/l	7.2	25	34.4	5.4	15%

Associated Samples:
Batch GP7663: C39344-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

Northern California
ACCUTEST
LABORATORIES

04/13/15

Technical Report for

United Technology Corporation

ENSTNM: UTC RFF Superfund Site - Rialto, CA

0888816743

Accutest Job Number: C39235

Sampling Date: 04/03/15

Report to:

Ensafe
5724 Summer Trees Road
Memphis, TN 38134
jteves@ensafe.com; jgable@envstd.com

ATTN: Josh Teves

Total number of pages in report: **16**

NELAP ACCREDITED TNI LABORATORY

James J. Rhudy
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Elvin Kumar 408-588-0200

Certifications: CA (ELAP 2910) AK (UST-092) AZ (AZ0762) NV (CA00150) OR (CA300006) WA (C925) DoD ELAP (L-A-B L2242)

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Accutest Laboratories

Sample Summary

United Technology Corporation

Job No: C39235

ENSTNM: UTC RFF Superfund Site - Rialto, CA
Project No: 0888816743

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
C39235-1	04/03/15	11:20	MB	04/04/15	AQ	Ground Water	COLTON 17G

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	United Technology Corporation	**Job No**	C39235
Site:	ENSTNM: UTC RFF Superfund Site - Rialto, CA	**Report Date**	4/13/2015 11:06:26 P

1 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were collected on 04/03/2015 and were received at Accutest on 04/04/2015 properly preserved, at 4.1 Deg. C and intact. These Samples received an Accutest job number of C39235. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Wet Chemistry By Method EPA 314

Matrix: AQ **Batch ID:** GP7663

- Sample(s) C39235-1MS, C39235-1MSD were used as the QC samples for Perchlorate.

Wet Chemistry By Method SM2510 B-97

Matrix: AQ **Batch ID:** GN16078

- Sample(s) C39216-2DUP were used as the QC samples for Specific Conductivity.

Accutest Laboratories Northern California (ALNCA) certifies that this report meets the project requirements for analytical data produced for the samples as received at ALNCA and as stated on the COC. ALNCA certifies that the data meets the Data QualityObjectives for precision, accuracy and completeness as specified in the ALNCA Quality Manual except as noted above. This report is to be used in its entirety. ALNCA is not responsible for any assumptions of data quality if partial data packages are used

Summary of Hits

Job Number: C39235
Account: United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA
Collected: 04/03/15

3

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
C39235-1	**COLTON 17G**					
Perchlorate		7.2	1.0	0.31	ug/l	EPA 314
Specific Conductivity		392	1.0	1.0	umhos/cm	SM2510 B-97

Northern California ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	COLTON 17G		
Lab Sample ID:	C39235-1	**Date Sampled:**	04/03/15
Matrix:	AQ - Ground Water	**Date Received:**	04/04/15
		Percent Solids:	n/a
Project:	ENSTNM: UTC RFF Superfund Site - Rialto, CA		

General Chemistry

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Perchlorate by IC								
Perchlorate	7.2	1.0	0.31	ug/l	1	04/11/15 00:26	PH	EPA 314
Specific Conductivity	392	1.0	1.0	umhos/cm	1	04/06/15 12:55	TN	SM2510 B-97

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
J = Indicates a result > = MDL but < RL

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Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

CHAIN OF CUSTODY

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2105 Lundy Ave, San Jose, CA 95131
(408) 588-0200 FAX: (408) 588-0201

UTCCASJ5836

FED-EX Tracking # 8079 3059 3573
Bottle Order Control #
Accutest Quote #
Accutest NC Job #: C C39235

Client / Reporting Information

Company Name: EnSafe Inc
Address: 2151 Salvio Street
City: Concord State: CA Zip: 94520
Project Contact: Josh Teres
Phone #: 925 305 2109
Samplers's Name: M. Baishi

Project Information

Project Name: RFF superfund site
Street:
City: Rialto State: CA
Project #: ~~[illegible]~~ 088816743
EMAIL: stevex@ensafe.com
Client Purchase Order #:

Requested Analysis

Perchlorate E314

Matrix Codes

WW- Wastewater
GW- Ground Water
SW- Surface Water
SO- Soil
OI-Oil
WP-Wipe
LIQ - Non-aqueous Liquid
AIR
DW- Drinking Water (Perchlorate Only)

Accutest Sample ID	Sample ID / Field Point / Point of Collection	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	NaHSO4	MEOH	ENCORE	Perchlorate E314	LAB USE ONLY
1	Colton 176	4/3/15	1120	MB	GW	1					X				X	

Turnaround Time (Business days)

Approved By:/ Date:

- [ ] 10 Day
- [x] 5 Day
- [ ] 3 Day
- [ ] 2 Day
- [ ] 1 Day
- [ ] Same Day

Emergency T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" - Results only
- [ ] Commercial "B" - Results with QC summaries
- [ ] Commerical "B+" - Results, QC, and chromatograms
- [ ] FULT1 - Level 4 data package
- [ ] EDF for Geotracker [ ] EDD Format
- Provide EDF Global ID
- Provide EDF Logcode:

Comments / Remarks

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	4/3	1 4-3-15 1145	2	4-3-15 1315	2
Relinquished by: 3 FEDEX	4/4/15 0925	Received By: Lee Bam 4	Relinquished By:	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	Appropriate Bottle / Pres. Y/N Labels match Coc? Y / N	Headspace Y/N Separate Receiving Check List used: Y / N

On Ice Y/N Cooler Temp. IRVINE

TEMP: 4.1/4.1

5.1 5

C39235: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: C39235 **Client:** ENSAFE/UTC **Project:** RFF SUPERFUND SITE - Rialto, CA

Date / Time Received: 4/4/2015 9:25:00 AM **Delivery Method:** FedEx **Airbill #'s:** 807530583573

Cooler Temps (Initial/Adjusted): #1: (4.1/4.1);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Therm ID:	IR1;		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

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San Jose, CA 95131
www/accutest.com

C39235: Chain of Custody
Page 2 of 2

Northern California ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39235
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Perchlorate	GP7663/GN16126	3.0	0.0	ug/l	25	24.3	97.2	85-115%
Specific Conductivity	GN16078	1.0	0.0	umhos/cm				

Associated Samples:
Batch GP7663: C39235-1
Batch GN16078: C39235-1
(*) Outside of QC limits

BLANK SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39235
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	Units	Spike Amount	BSD Result	RPD	QC Limit
Perchlorate	GP7663/GN16126	ug/l	25	22.6	7.2	

Associated Samples:
Batch GP7663: C39235-1
(*) Outside of QC limits

6.2
6

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39235
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Specific Conductivity	GN16078	C39216-2	umhos/cm	398	396	0.5	0-10%

Associated Samples:
Batch GN16078: C39235-1
(*) Outside of QC limits

6.3
6

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39235
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Perchlorate	GP7663/GN16126	C39235-1	ug/l	7.2	25	32.6	101.6	80-120%

Associated Samples:
Batch GP7663: C39235-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

MATRIX SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C39235
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MSD Result	RPD	QC Limit
Perchlorate	GP7663/GN16126	C39235-1	ug/l	7.2	25	34.4	5.4	15%

Associated Samples:
Batch GP7663: C39235-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

Northern California
ACCUTEST
LABORATORIES

08/25/15

Technical Report for

United Technology Corporation

ENSTNM: UTC RFF Superfund Site - Rialto, CA

0888816743

Accutest Job Number: C41179

Sampling Date: 08/10/15

Report to:

Ensafe
5724 Summer Trees Road
Memphis, TN 38134
jteves@ensafe.com; jgable@envstd.com

ATTN: Josh Teves

Total number of pages in report: **16**

NELAP ACCREDITED TNI LABORATORY

James J. Rhudy
Lab Director

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Client Service contact: Elvin Kumar 408-588-0200

Certifications: CA (ELAP 2910) AK (UST-092) AZ (AZ0762) NV (CA00150) OR (CA300006) WA (C925) DoD ELAP (L-A-B L2242)

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Accutest Laboratories

Sample Summary

United Technology Corporation

Job No: C41179

ENSTNM: UTC RFF Superfund Site - Rialto, CA
Project No: 0888816743

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
C41179-1	08/10/15	09:30	MB	08/11/15	AQ	Ground Water	COLTON 17G08115

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	United Technology Corporation	**Job No**	C41179
Site:	ENSTNM: UTC RFF Superfund Site - Rialto, CA	**Report Date**	8/25/2015 10:57:56 P

1 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were collected on 08/10/2015 and were received at Accutest on 08/11/2015 properly preserved, at 4.1 Deg. C and intact. These Samples received an Accutest job number of C41179. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Wet Chemistry By Method EPA 314

Matrix: AQ **Batch ID:** GP8213

- Sample(s) C41111-13MS, C41111-13MSD were used as the QC samples for Perchlorate.

Wet Chemistry By Method SM2510 B-97

Matrix: AQ **Batch ID:** GN17106

- Sample(s) C41131-1DUP were used as the QC samples for Specific Conductivity.

Accutest Laboratories Northern California (ALNCA) certifies that this report meets the project requirements for analytical data produced for the samples as received at ALNCA and as stated on the COC. ALNCA certifies that the data meets the Data QualityObjectives for precision, accuracy and completeness as specified in the ALNCA Quality Manual except as noted above. This report is to be used in its entirety. ALNCA is not responsible for any assumptions of data quality if partial data packages are used

Summary of Hits

Job Number: C41179
Account: United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA
Collected: 08/10/15

3

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
C41179-1	**COLTON 17G08115**					
Perchlorate		1.9	1.0	0.65	ug/l	EPA 314
Specific Conductivity		319	1.0	1.0	umhos/cm	SM2510 B-97

Northern California ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	COLTON 17G08115		
Lab Sample ID:	C41179-1	**Date Sampled:**	08/10/15
Matrix:	AQ - Ground Water	**Date Received:**	08/11/15
		Percent Solids:	n/a
Project:	ENSTNM: UTC RFF Superfund Site - Rialto, CA		

General Chemistry

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Perchlorate by IC								
Perchlorate	1.9	1.0	0.65	ug/l	1	08/16/15 20:08	PH	EPA 314
Specific Conductivity	319	1.0	1.0	umhos/cm	1	08/16/15 16:00	PH	SM2510 B-97

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
J = Indicates a result > = MDL but < RL

Northern California ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

CHAIN OF CUSTODY

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(408) 588-0200 FAX: (408) 588-0201

FED-EX Tracking # 7742 5051 4880
Bottle Order Control #
Accutest Quote #
Accutest NC Job #: C41179

Client / Reporting Information

Company Name: Ensafe
Address: 1151 Salvio St. #301
City: Concord State: Ca Zip:
Project Contact: J. Teves
Phone #: 925 3052109
Samplers's Name: M. Barishi

Project Information

Project Name: UTC RFF Superfund
Street:
City: Rialto State: Ca
Project #: 0888816743
EMAIL: jteves@ensafe.com
Client Purchase Order #:

Requested Analysis

E 314

Matrix Codes

WW- Wastewater
GW- Ground Water
SW- Surface Water
SO- Soil
OI-Oil
WP-Wipe
LIQ - Non-aqueous Liquid
AIR
DW- Drinking Water (Perchlorate Only)

Accutest Sample ID	Sample ID / Field Point / Point of Collection	Collection Date	Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	NaHSO4	MEOH	ENCORE	E 314	LAB USE ONLY
1	Colton 176-081015	8/10	0930	MA	GW	1					1				X	

Turnaround Time (Business days)

Approved By / Date:

- [X] 10 Day
- [ ] 5 Day
- [ ] 3 Day
- [ ] 2 Day
- [ ] 1 Day
- [ ] Same Day

Emergency T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" - Results only
- [ ] Commercial "B" - Results with QC summaries
- [ ] Commerical "B+" - Results, QC, and chromatograms
- [ ] FULT1 - Level 4 data package
- [ ] EDF for Geotracker [ ] EDD Format
- Provide EDF Global ID
- Provide EDF Logcode:

Comments / Remarks

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	8/10 1600	1 8/10 1600	2	8/10 1700	2
Relinquished by: 3	Date Time: 8/11/15 1900	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal # Intact	Appropriate Bottle / Pres. Y / N; Labels match Coc? Y / N	Headspace Y / N; Separate Receiving Check List used: Y / N; On Ice Y / N; Cooler Temp. 4.1/4.1

IRVINE

5.1 5

C41179: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: C41179 **Client:** ENSAFE **Project:** UTC RFF SUPERFUND

Date / Time Received: 8/11/2015 9:40:00 AM **Delivery Method:** FedEx **Airbill #'s:** 774250514880

Cooler Temps (Initial/Adjusted): #1: (4.1/4.1);

Cooler Security	Y	or N		Y	or N
1. Custody Seals Present:	☑	☐	3. COC Present:	☑	☐
2. Custody Seals Intact:	☑	☐	4. Smpl Dates/Time OK	☑	☐

Cooler Temperature	Y	or N
1. Temp criteria achieved:	☑	☐
2. Therm ID:	IR1;	
3. Cooler media:	Ice (Bag)	
4. No. Coolers:	1	

Quality Control Preservation	Y	or N	N/A
1. Trip Blank present / cooler:	☐	☐	☑
2. Trip Blank listed on COC:	☐	☐	☑
3. Samples preserved properly:	☑	☐	
4. VOCs headspace free:	☐	☐	☑

Sample Integrity - Documentation	Y	or N
1. Sample labels present on bottles:	☑	☐
2. Container labeling complete:	☑	☐
3. Sample container label / COC agree:	☑	☐

Sample Integrity - Condition	Y	or N
1. Sample recvd within HT:	☑	☐
2. All containers accounted for:	☑	☐
3. Condition of sample:	Intact	

Sample Integrity - Instructions	Y	or N	N/A
1. Analysis requested is clear:	☑	☐	
2. Bottles received for unspecified tests	☐	☑	
3. Sufficient volume recvd for analysis:	☑	☐	
4. Compositing instructions clear:	☐	☐	☑
5. Filtering instructions clear:	☐	☐	☑

Comments

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5.1

5

C41179: Chain of Custody
Page 2 of 2

Northern California ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C41179
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Perchlorate	GP8213/GN17110	3.0	0.0	ug/l	25	23.7	94.8	85-115%
Specific Conductivity	GN17106	1.0	0.0	umhos/cm				

Associated Samples:
Batch GP8213: C41179-1
Batch GN17106: C41179-1
(*) Outside of QC limits

BLANK SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C41179
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	Units	Spike Amount	BSD Result	RPD	QC Limit
Perchlorate	GP8213/GN17110	ug/l	25	23.9	0.8	

Associated Samples:
Batch GP8213: C41179-1
(*) Outside of QC limits

6.2
6

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C41179
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Specific Conductivity	GN17106	C41131-1	umhos/cm	424	420	0.9	0-10%

Associated Samples:
Batch GN17106: C41179-1
(*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C41179
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Perchlorate	GP8213/GN17110	C41111-13	ug/l	3.2	25	24.9	86.8	80-120%

Associated Samples:
Batch GP8213: C41179-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

MATRIX SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: C41179
Account: UTCCASJ - United Technology Corporation
Project: ENSTNM: UTC RFF Superfund Site - Rialto, CA

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MSD Result	RPD	QC Limit
Perchlorate	GP8213/GN17110	C41111-13	ug/l	3.2	25	25.6	2.8	15%

Associated Samples:
Batch GP8213: C41179-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits